Marine Review

The National Publication Covering the Business of Transportation by Water

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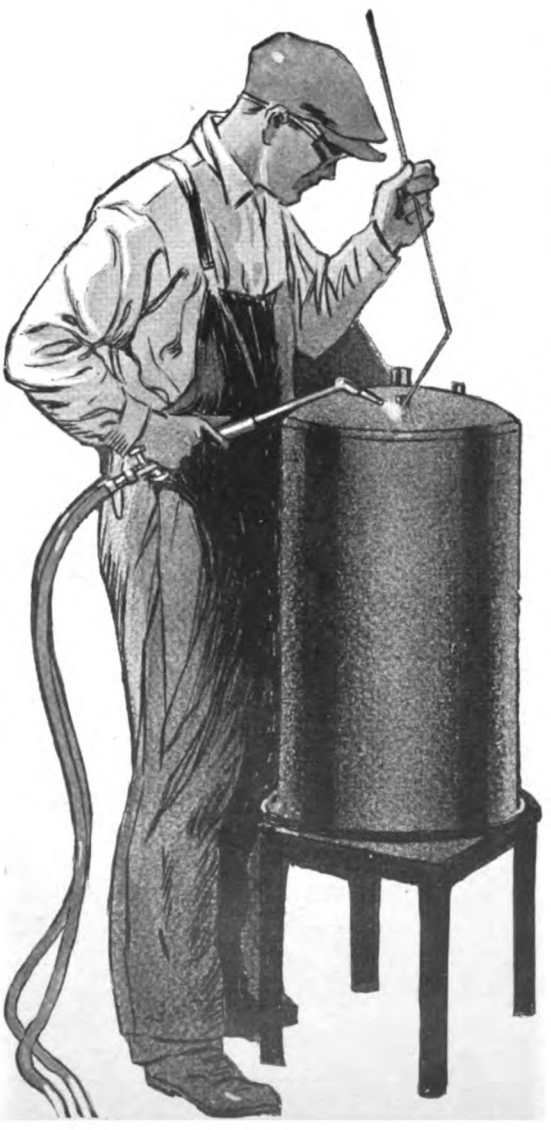

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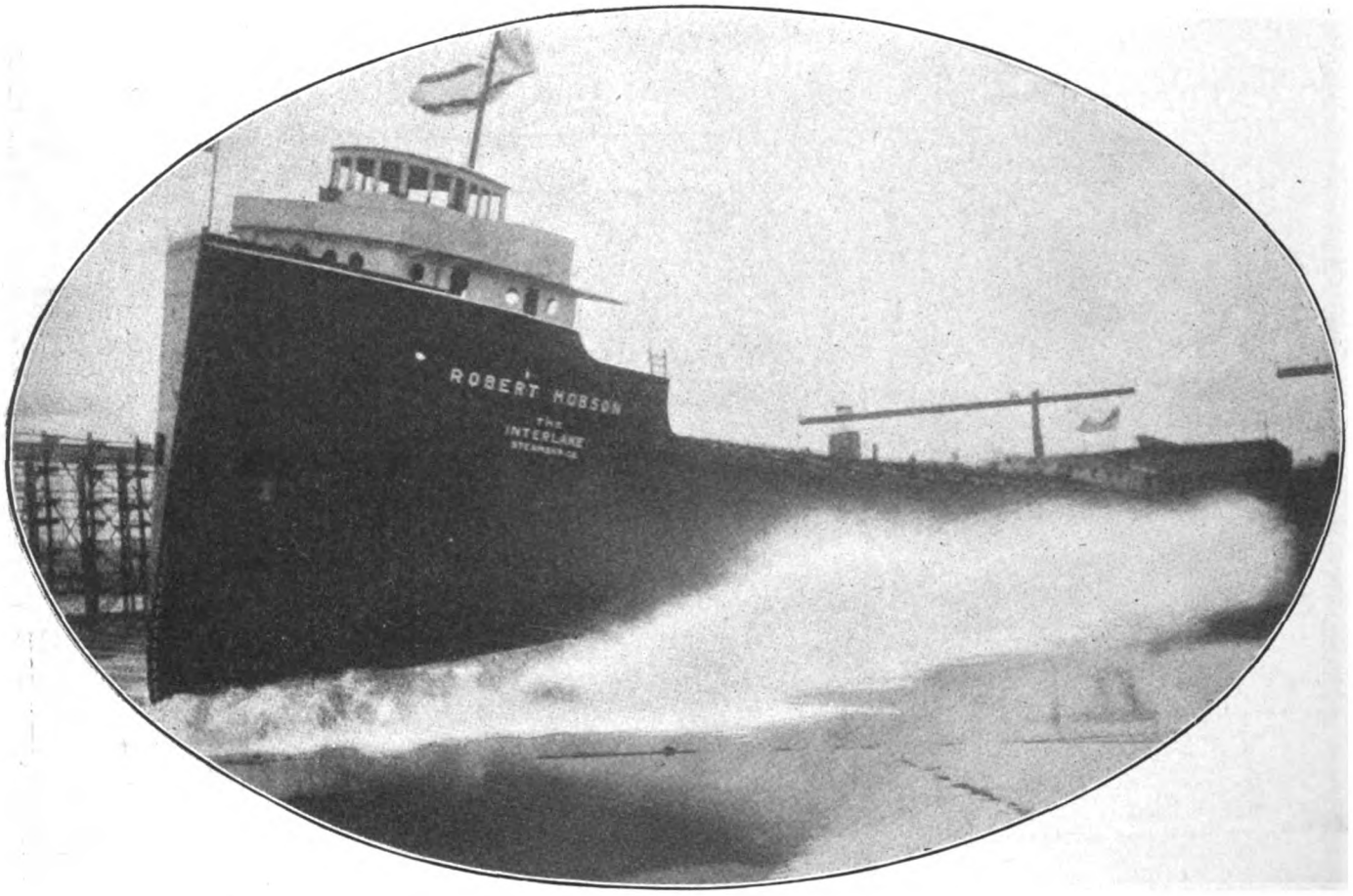
The American Ship



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Launched October 30, 1926

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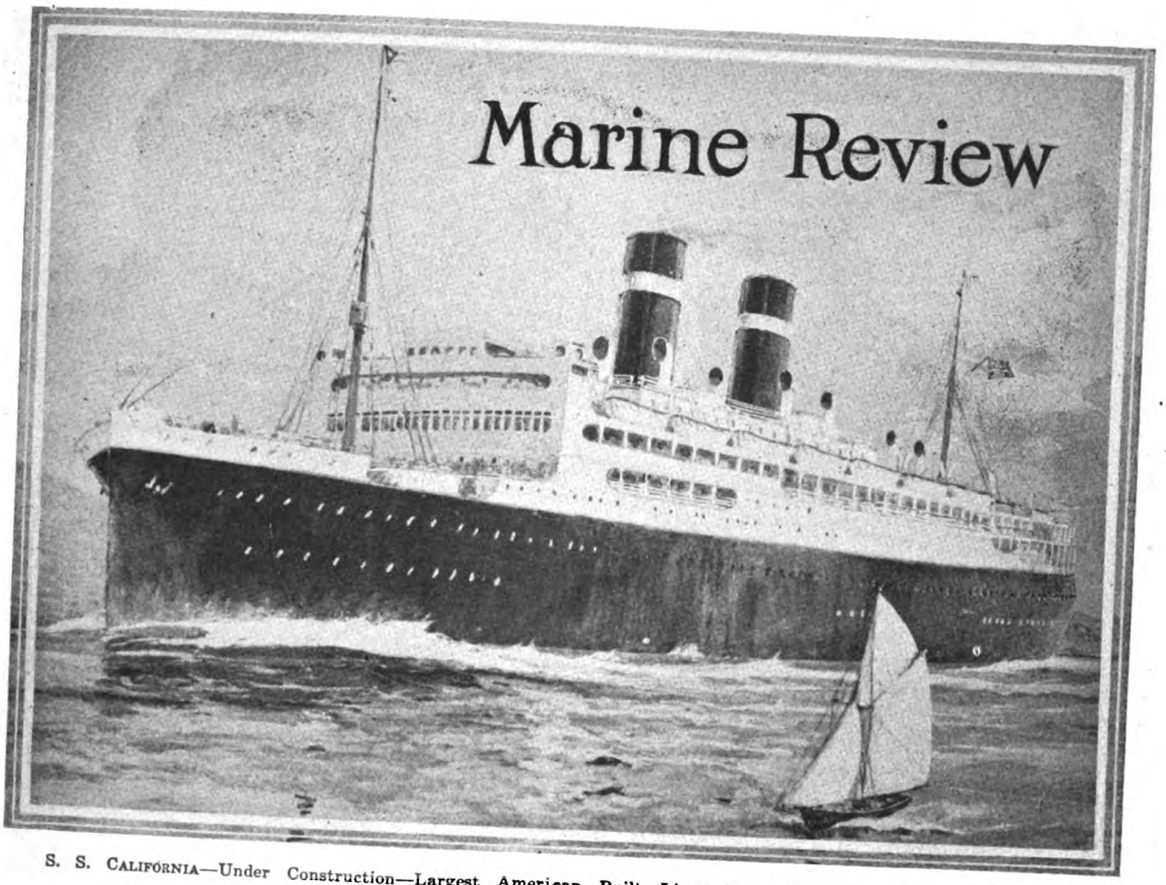
Marine Review



S. S. CALIFORNIA—Under Construction—Largest American Built Liner—From Painting by F. J. Hoertz

Wanted—A Responsible Private Operator for the U. S. Lines

IS THE United States lines for sale? This question can best be answered by saying it is and it isn't; also it has not yet been sold. However, the fact remains that on Sept. 20 and again on Sept. 27, of last year advertisements were published throughout the country inviting offers for the purchase or charter of the ships and services of the United States lines and the American Merchant lines.

According to its own statement the shipping board "hoped and expected to receive as a result of these advertisements a definite indication of the immediate prospects of transferring to responsible private American ownership the service which it is operating under the requirements of the merchant marine act of 1920."

Offers were invited at that time "to determine if the continued maintenance of the service can be insured by its transfer to private American control, under conditions guaranteeing equal or superior service as furnished under shipping board operation including provision for expansion and replacement as may become necessary." Four months have passed since this statement was issued and the United States lines is still doing business under government ownership and operation. Several bonafide offers were received so that one of two things is apparent. First, that in the opinion of the board no offer was received from a responsible experienced operator who could really meet the guarantee required. Or second, that the board has had, partly due to the intervention of congress, a complete change of heart and does not now want to sell, thus more firmly than ever wedding the present administration to the policy of continued government ownership and operation.

For the sake of the ultimate welfare of the merchant marine we hope that it is not the latter of these two alternatives that so far has deterred the board from accepting the most favorable offer. It is not fair to accuse the members of the shipping board of lack of good faith so we must assume that the board is sincere in its opinion that no adequate offer has been received from any responsible private operator. Also it must be granted that the board is in the best position to acquire first-hand accurate knowledge of all of the facts.

But it may be questioned whether the board is

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showing good judgment in so far as the future of the American marine is concerned in taking the stand it does. In any case the decision of the board to terminate the negotiations for the sale of its transatlantic lines is justly subject to the closest scrutiny. Testimony of the chairman of the shipping board and the president of the Fleet corporation before a subcommittee of the senate committee on commerce early in January may be taken to represent their present policy of reluctance to let go of the United States lines.

Chairman O'Connor said that he was "absolutely in favor of selling the vessels if the right kind of directorate backed the purchaser." By which he had in mind large commercial interests who would give these vessels the transportation of their own freight. These directors would have to show that they would patronize American ships. The chairman further stated that there were no immediate prospects of getting private operators for the United States and American Merchant lines, and that though the offers submitted by W. H. Winchester & Co. Inc., and Gibbs Bros. Inc. and by William F. Kenny and his associates were the most generous received, they were nevertheless considered inadequate. It was made clear by Mr. O'Connor that the shipping board would have rejected all offers for the transatlantic lines at its regular meeting on Dec. 14 if the senate had not ordered an inquiry into the proposed sale.

In fairness it must be admitted that the board is faced with an extremely complicated and difficult situation. Now that American flag passenger ships are in operation in transatlantic service they will be continued. There can be no question of withdrawal. We believe that throughout the land there is overwhelming sentiment for maintaining and improving this service so that its ships will be second to none in speed, comfort and luxury and its personnel a credit to the splendid traditions of American seamanship.

The great problem is to decide upon a wise policy to accomplish this purpose with a minimum of aid from public funds, a policy that will effect a healthy and vigorous renaissance of the American merchant marine approaching proportionately to some degree of its pre-eminence in the early history of the nation.

The suggestions of a policy as outlined in the testimonies of the chairman of the shipping board and the

(*Continued on Page* 40)

Bids Received by Board

J. H. Winchester & Co. and Gibbs Bros. Inc.: Offered to purchase the five vessels of the American Merchant lines (the Winchester company are now operating these vessels for the board) for $200,000 each, a total of $1,000,000. And to charter the vessels of the United States lines on a hire of $5000 a month, agreeing further to pay the government 50 per cent of the net profits, accruing to an operating company to be formed, from the operation of both fleets as well as the operation of two new passenger liners which the bidders propose to build at a cost of not less than $30,000,000, after the deduction of depreciation and 6 per cent on the capital invested by the company. A loan from the government of two-thirds of the cost of building the two new vessels was also included.

William F. Kenny and Associates: Offered to buy the five vessels of the American Merchant lines for $200,000 each, a total of $1,000,000 and to charter the United States lines. An offer was also made to purchase the S. S. AMERICA for $2,000,000 after reconditioning.

Atlantic Transport Co.: Offered to buy the LEVIATHAN for $4,000,000.

Potter Steamship Co: Offered to buy the PRESIDENT HARDING or the PRESIDENT ROOSEVELT for $1,050,000.

Kermit Roosevelt, and Associates, H. H. Raymond, E. P. Farley, E. J. McCormack and A. V. Moore: Offered to buy the five vessels of the American Merchant lines for $252,000 each, a total of $1,260,000 on the condition that the operation of the United States lines be allocated to the new company to be organized should the bid be accepted.

High Points in Testimony Before the Senate Committee on Commerce

T. V. O'Connor — Jan. 3-4-5, 1927 — Gen. A. C. Dalton

Chairman of the United States Shipping Board

1. *He would sanction the sale of the United States lines and the American Merchant lines for a fair price.*
2. *A fair price for the two lines was stated to be* $15,000,000, *and that the lines should not be sold under any conditions for less than the cost of reconditioning the* LEVIATHAN *or approximately* $10,000,000.
3. *That the lines must be sold to a company that can operate them.*
4. *Talk about an American merchant marine without provisions for replacements "makes us the capital joke of the world."*
5. *Cost of building vessels in the United States is* 32 *to* 40 *per cent more than in foreign countries.*
6. *There is very little difference in cost of operation, probably less than one-half of* 1 *per cent.*
7. *In favor of proposal to build two additional ships of the* LEVIATHAN *class for transatlantic service and that the President has not suggested refraining from the use of the shipping board construction loan fund, which now totals about* $60,000,000, *for this purpose. Plans for the two proposed ships have been prepared with the approval of the navy department as to their suitability for use in national defense.*
8. *If the American merchant marine is to be privately operated a subsidy of some nature must be provided. A subsidy is essential and is now in force in England and France.*
9. *If mail contracts were turned over to the merchant marine of this country millions of dollars would be added to its income annually.*
10. *It is just as important to have shipyards as it is to have ships in the merchant marine.*

President of the Emergency Fleet Corp.

1. *For government ownership and operation of the merchant marine under present conditions.*
2. *If congress would provide sufficient funds such operation could be made profitable.*
3. *The present law should be changed so that the merchant marine may be owned and operated as a private enterprise by the government, if other plans provided in the merchant marine act fail.*
4. *The American people have displayed a willingness to support the building of a national American merchant marine through government ownership and operation.*
5. *Defended government operation against accusations of inefficiency by calling attention to the construction of the Panama canal at a cost of* $365,000,000 *under the direction of a lieutenant colonel of engineers after the failure of a great corporation and a practical failure of two of the outstanding engineers of America.*
6. *Board now operating* 24 *services reaching to practically every part of the globe. Approximately* 327 *vessels are employed and the cost to the government for the fiscal year* 1927 *will be approximately* $17,500,000.
7. *The United States lines earned* $1,600,000 *in profits on its operations from July to October,* 1926, *an increase of nearly* $1,000,000 *over the same period of* 1925, *and that profits during* 1927, *it is anticipated, will be greater than any previous year.*
8. *Asked if he thought it wise to sell the lines when they were making a profit he replied that to carry out the terms of the merchant marine act they must be sold but that his own personal opinion was "not to sell."*
9. *If the American flag is to remain on the high seas replacements must be provided for.*

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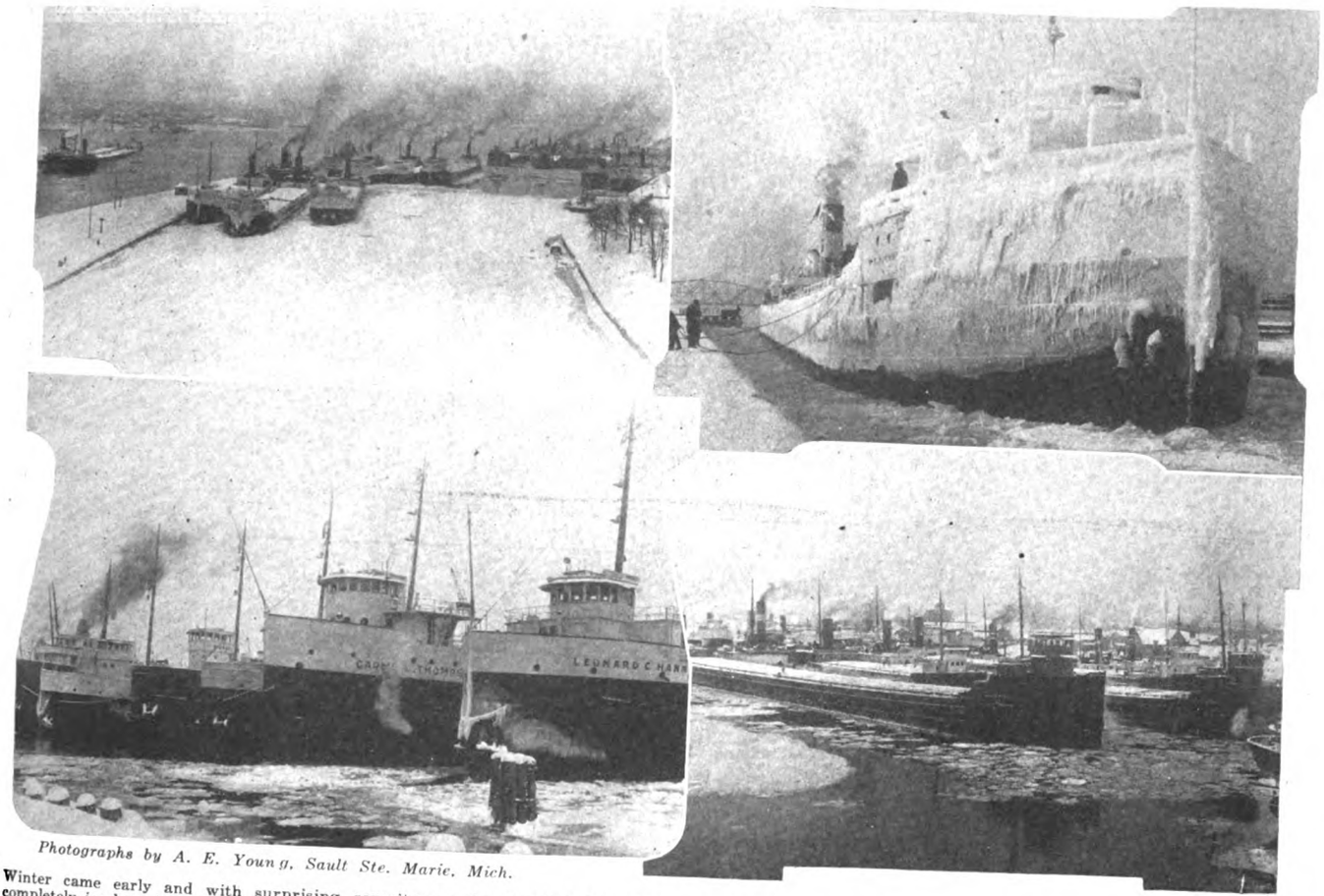
Icebound—No Danger to Men or Ships



Photographs by A. E. Young, Sault Ste. Marie, Mich.

Winter came early and with surprising severity on the Great Lakes, Nov.-Dec., 1926. Many ships with their last down lake cargoes were completely ice bound for days—Upper Left—Large fleet of loaded freighte rs tied up at Soo on account of ice—Upper Right—Steamer W. E. FITZGERALD, ice covered from zero weather on Lake Superior, was next to the last vessel locked through the Soo during the season of 1926—Lower Left—A few of the great fleet of lake freighters waiting for tugs to break the ice in St. Mary's river—Lower Right—A section of the fleet tied up at the Soo waiting a chance to get through

NAVIGATION closed on the Great Lakes for the season of 1926 under unusually severe weather conditions which threatened a heavy economic loss. For a time late in November and the first days of December ice had formed so rapidly in St. Marys river, in the approaches and in the canals at the Soo, that it was feared that 100 odd freighters, made up of the last down bound vessels and others up bound to the head of the lakes for grain cargoes waiting to get through, would be forced to stay where they were for the winter. The temperature was exceptionally low for so early in the year. Ice had begun to interfere with steamers in approaching the ore docks at Superior as early as Nov. 21. The temperature at Duluth on Nov. 22, was 10 above zero Fahr. and ore had to be steamed before it could be loaded. Continuous heavy weather was experienced in the middle and latter part of November.

The temperature at the Soo on Nov. 27, was 2 degrees below zero and the ice at Duluth was from 10 to 12 inches thick with consequent very slow movement of vessels in the harbor. Ice began to interfere seriously with vessels in the Soo river as early as Nov. 28 and 29. As much as 24 hours were lost in some cases. The ice in this vicinity at Mud lake, was about 4 inches thick and ice fields extended from Pipe island to the Dike, tugs having to break the ice for upbound boats. Sault Ste. Marie reported on Nov. 30, that ice continued to hold up steamers in St. Marys river, the most difficult section being between the Dike and Little Mud lake. The delays occasioned tended to rapidly increase the fleet both down bound and up bound waiting to get through the canal. Ice 4 to 6 inches in thickness had to be broken through and the broken ice carried by the current in the river channels piled up so deep in places that it touched the bottom.

By Dec. 4, more than 100 freighters were fast in the ice below the Soo. The temperature at that point on that day was reported to be 8 degrees below zero. Great concern was felt by all the vessel owners, not as erroneously stated in the press in regard to the immediate safety of the personnel or of the ships, because there was no danger, but on account of the possibility of the entire fleet being compelled to remain where it was for winter quarters which of course, would have necessitated a skeleton crew on board and keeping up steam until the opening of navigation. Also the vessels so tied up could not have conveniently received attention for regular over-hauling and repairs, nor would such vessels in many instances have been in an advantageous location for beginning the season of 1927. In fact it would have meant the continuation of the voyage down bound with final

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cargoes as the initial step in the operations at the opening of navigation in 1927, and the same is true for up bound vessels though it would not so seriously have affected them in instances where they were planning to go to upper lake ports for winter storage of grain.

The responsibility for concerted action to overcome this serious tie up was met by the Lake Carriers' association headed by its president J. S. Ashley, manager of the M. A. Hanna fleet, with directness and energy. L. C. Sabin, vice president of the Lake Carriers' association went to the Soo to represent the Lake Carriers. The ice breaking carferry, SAINTE MARIE, owned by the Mackinaw Transportation Co. was chartered at the instance of Mr. Ashley, who also appointed Capt. Fred A. Bailey who had had a great deal of experience, to take full charge of the ice breaking. The SAINTE MARIE, a powerful vessel of 62 feet beam and with heavy steel ice crushing prow arrived at the Soo and commenced breaking ice on Dec. 4. Mr. Ashley attempted to obtain the use of an additional carferry but in this he was unsuccessful as the owners of this class of vessel said they could not be spared from their regular routes. The American tug GENERAL and the Canadian tug STRATHBOGIE were also used to help clear the channels.

Captain Bailey was given orders to continue keeping the channel open until midnight on Dec. 14. This the captain did with such success that the entire fleet of waiting vessels was cleared, up and down, through the canal by Dec. 14. The most serious delays were overcome by Dec. 6, and from that date to the fourteenth the channel was made and kept passable. In all nearly 250 vessels were assisted through the ice. Vessels trading to Lake Superior late in November and early in December probably lost one trip due to delays. As early as Dec. 4, a Cleveland steamer at Duluth was ordered into winter quarters and others were dropped when they reached ports at the head of the lakes.

The last two steamers bound from the head of the lakes to get through the canals at the Soo were the W. E. FITZGERALD and M. C. SMITH. These two vessels sailed with a number of other American vessels from Fort William on Dec. 12. The FITZGERALD arrived at the Soo at 1:00 p.m. Dec. 18, and the SMITH arrived at 3:30 p. m. on the same day. They were compelled to work through ice about 6 inches in thickness. The temperature at the Soo on Dec. 15, had been 12 degrees below zero and ice was solid in the West Neebish channel. The ice crushing carferry SAINTE MARIE had been released as per arrangement at midnight on Dec. 14, and sailed from the Soo on Dec. 15. These last comers got through solely on their nerve knowing that they could not hope to receive any official aid. Ceptain Bailey stated that vessels due to arrive could not be taken through the lower river and consequently a number of steamers were ordered into winter quarters. The FITZGERALD and the SMITH however, persisted and got through. Criticism appeared in the press directed at the vessel owners for permitting their vessels to be caught in such a dilemma erroneously drawing the conclusion that the men on board were thus subjected to great danger and terrible hardships. As a matter of fact the vessels that were caught in the ice were engaged in completing their regular schedule and the conditions which they met were most unusual and unexpected. It was the severest weather ever experienced so early in the season. There isn't a vessel man, anticipating such conditions who would not much rather have had his vessel safely laid up at winter quarters. The desire for gain on the part of vessel owners had nothing whatsoever to do with it. There was no danger, very little real hardship was experienced by the crews, and there was practically no damage done to the ships themselves.

The movement of bulk cargoes on the Great Lakes is admitted to be of great economic importance to the entire nation. It therefore seems that the responsibility for keeping the channels clear of ice and in navigable condition up to a reasonable time ought to rest with the federal government. For this duty the United States coast guard seems to be best fitted.

Record Cargo Movement Great Lakes—1926

Even though the navigation season of 1926 on the Great Lakes started late and ended early on account of troublesome ice conditions, it will go into history as the record breaking year for the movement of bulk cargo. The accompanying compilation gives the tonnage of various commodities carried for the past ten years, and it is interesting to note that while the total is a record, greater amounts of each commodity except stone have been moved in other years.

The tonnage of stone carried has been steadily increasing, reaching a record movement of over 12½ million tons in 1926.

Bulk Cargo Movement Grows

Shipments on the Great Lakes for 1926 Compared with Other Years

Year	Iron ore gross tons	Coal net tons	Grain, various kinds net tons	Stone net tons	Total net tons
1926	58,537,855	31,011,544	12,087,316	12,628,244	121,289,502
1925	54,081,298	28,127,359	13,320,346	11,351,948	113,370,707
1924	42,623,572	25,860,515	15,222,787	9,225,624	98,047,327
1923	59,036,704	33,137,028	11,850,446	9,920,422	121,029,004
1922	42,613,726	19,868,925	14,267,020	7,592,137	89,454,848
1921	22,300,726	26,660,652	12,470,405	3,925,705	68,033,575
1920	58,527,226	26,409,710	6,736,348	7,821,980	106,518,531
1919	47,177,395	26,424,068	6,091,703	6,407,285	91,761,238
1918	61,156,732	32,102,022	6,548,680	7,467,776	114,614,018
1917	62,498,901	31,192,613	7,161,716	6,748,801	115,100,399
1916	64,784,198	28,440,483	10,555,975	5,553,927	117,052,686

A Coal Loading Record

Accustomed as men and operators on the Great Lakes are to great speed in loading bulk cargoes, the record established by the S. S. CHILORE *of the Ore Steamship Corp. in loading* 20,055 *tons of coal in* 5 *hours and* 20 *minutes at Sewalls Point, Norfolk, Va., last summer may be conceded good work and shows that where bulk cargoes of sufficient quantity and steady supply prevail, whether on the coast or on the lakes, means will be provided for quick handling.*

An account of this record was sent to the editor by Capt. R. C. Mayer, who sailed on the Great Lakes prior to 1917. *He was much impressed by this performance though familiar with the speed of loading on the lakes. The* CHILORE *lay at the Virginia railroad coal pier No.* 2 *and* 450, *fifty ton cars were dumped, or enough cars to extend in a solid line a distance of* 5 *miles.*

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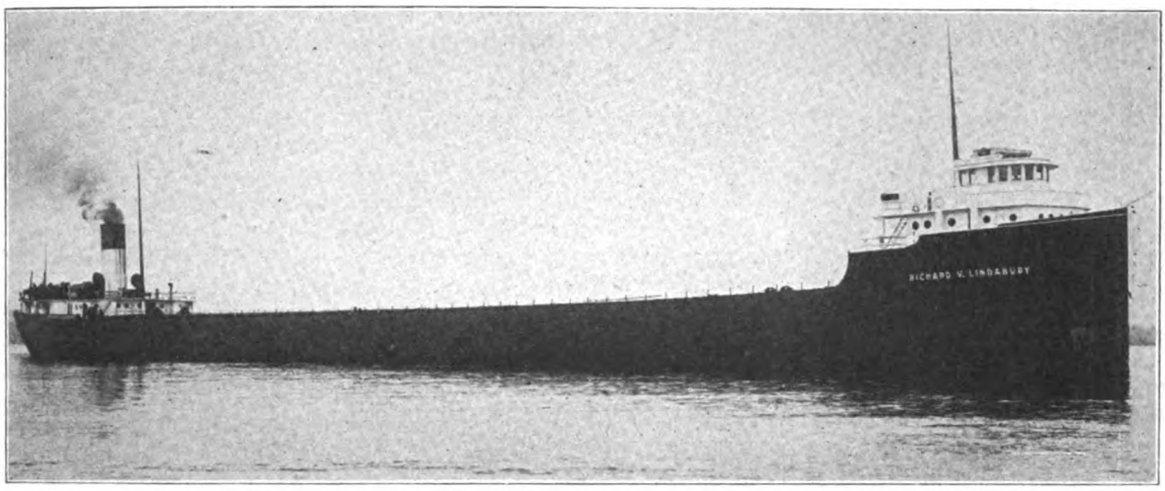

RICHARD V. LINDABURY, *Typical Modern Great Lakes Bulk Cargo Steamer*

Reduce Lake Vessels' Fuel Bill-I

A Study of the Influence of Boilers, Main Machinery and Auxiliaries on Earnings of Great Lakes Cargo Vessels

By Henry Penton

IT HAS been the thought of many that Professor Sadler's article in the July 1926 number of MARINE REVIEW on lowering of Lake levels and its effect on ships would have provoked discussion, at least with regard to some of the constructive criticisms he offers. Dr. Sadler questions the economic value of certain equipment, such as water-tube boilers, with higher pressures, superheaters, surface condensers with their special auxiliaries, and independent steam-driven auxiliaries for various purposes. This invites the question as to whether the owner is fully informed as to the influence of such equipment upon his capital and operating costs or whether its adpotion is due to a belief that it represents progress and improvement. One may be pardoned a sense of disappointment that a problem of such real magnitude does not arouse more interest among those vitally concerned.

In response to the suggestion of several the writer offers the following comments, which will treat, practically exclusively, of engineering features and must be clearly understood as referring strictly to Great Lakes operation of cargo ships. It is quite possible therefore that some of the arguments advanced may be somewhat at variance with accepted practice or essentials in other trades and types.

HENRY PENTON

The question of improvement in operating cost resolves itself principally into consideration of the subject of fuel although capital charges are necessarily involved to some extent. Fuel is not only the largest item but it is practically the only one susceptible of treatment, since the other principals, payroll and insurance, are beyond the operator's control.

First, then, we approach the fuel-consuming, or steam-making plant. We also approach a subject which everyone will agree is "loaded," that is to say scotch or water-tube boilers. It is not proposed here to reopen the "battle of the boilers" or to traverse the ground fought over for so many years by the partisans of either, but to endeavor to determine which type is the more economical for the trade under consideration with the fuel available, supported by data drawn from actual operation. It is important to make clear here that in assembling the boiler performance data which follows, every available source was drawn upon without any bias or preference, the only restraint as to either type being that figures should be from authentic sources. Their accuracy the author cannot of course vouch for; they are presented for what they may be worth but are believed reliable and in no instance are based upon verbal statements or general report and are strictly limited to Great Lakes ships. The figures cover the entire period of water-

The author, Henry Penton, consulting marine engineer of Cleveland, has specialized in lake vessel design. This is Part I of Mr. Penton's article. Part II will be published in an early issue.

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tube boiler history on the Great Lakes and a somewhat longer period as to scotch, but the number of examples cited is of course disproportionate in view of the very great preponderance of the latter.

That the water-tube boiler has advantages of its own is freely conceded by all, but for the present purpose we have to consider only the economic features since several of the advantages referred to assume relatively little importance in the trade under consideration The principal feature which retains its value is ability to raise steam quickly from a cold condition, but even this, valuable as it is, entails some sacrifices. It seems fair to say that the time required to raise steam in a scotch boiler from a cold condition is easily overstressed so far as operation is concerned. Practically invariably other boilers are under steam and the dead boiler may easily be at steam temperature by the time the heating surfaces are submerged.

Water Tube Boiler Advantages

Quick steaming, while partly due to the comparative freedom from internal stresses and which permits of forcing fires from the start, is even more due to the small volumetric capacity per unit of heating surface, or in other words the relatively small amount of water contained and the restricted volume of steam room which contributes to a rapid rise in pressure when once evaporation has begun. The penalty for this lies in the small heat reserve due to the limited volume of water and the relatively small weight of steam contained in the steam spaces.

The great heat reserves stored up in the larger water content of the scotch boiler enable it to shoulder and carry load and fire fluctuations without noticeable pressure drop on the one hand or blowing safety valves on the other. So well is the value of such heat reserves established that the equipment of many shore plants includes what is known as a steam accumulator, which is merely a large cylindrical vessel about two-thirds filled with water and connected to the boilers and steam lines. At times when the boiler capacity is in excess of demand the surplus is absorbed by the accumulator through its water content and when the demand exceeds boiler output at any time the surplus is restored to the lines. The boilers therefore are enabled to work at a more nearly constant and economical rate and with a lower investment cost. Some of these accumulators reach very large dimensions, up to 7000 cubic feet or more, but their use is of course not feasible aboard ship. A flat pressure curve is of peculiar advantage in marine work in the maintenance of uniform speed and where pressures fluctuate the loss is easily perceptible in revolutions.

It is believed that these statements are in accord with general observation and are not controversial.

Coming to the subject of comparative economy it must be admitted that data as to actual evaporation are far from satisfactory. There does not seem to be any good reason why, under parallel conditions as to working, fuel, air supply, draft and stack temperatures, etc., there should be any noticeable difference between the two types, but this parallelism practically never exists. Figures there are in abundance; there is no lack of data as to fuel weights which may be assumed to be fairly accurate, nor as to feed water weights which in most cases are either rough estimates based on pump displacements or are derived from meter measurements which are unreliable at best. In very few instances has feed water been actually weighed but these are hardly numerous enough to establish a comparative rate for such an extensive field. Data as to fuel values are also almost entirely lacking so that the prime essentials for determination of boiler efficiency are sadly incomplete. Trial data from scores of ships are at hand but in the main so far as fuel economy goes they are resolved into fuel per indicated horsepower and, in general, for all purposes.

The situation therefore stands thus; we can (1) make comparisons as to evaporative efficiency between the few examples where feed water weights and fuel values are accurately known, and (2) we can take all available data as to fuel per indicated horsepower where such are reliable, and attempt to draw conclusions therefrom. The latter group is quite numerous. In many instances fuel values are given but they are incomplete and they might be assumed to average out. At all events the fuel quality is not under control and the figures must be accepted as the everyday work whether under best conditions or not. The first group is presented in Table I below and the second in Table II on page 58.

Water Rates Inaccurate

It may be said here that it is difficult to understand how some of the apparent duties based upon meter readings receive the consideration they do. Instances are found where the apparent evaporation is doubtful if not impossible and it is doubtless equally true that in other instances the apparent rate is too low. A fast meter gives a high water rate both for evaporation and for steam consumption at the engines while with a slow meter the exact reverse obtains. Furthermore, even meters specially built for specified temperatures, velocities and pressures, and a definite error rate apparently ascertained upon calibration, do not function uniformly. Some outstanding examples of this have occurred where the hourly rate varied as much as 30 per cent without any change whatever in any working condition. It is easy to see what marvelous efficiencies or sad deficiencies may result under such circumstances. The lesson to be drawn is that data as to water consumption or evaporation based on other than actual weight are practically worthless and ought to be eliminated. Anyone receiving such figures with confidence merely deceives himself. There are no difficulties of moment in the way of such determination; it is not even necessary to use a scale. Portable tanks of suitable proportions are easily made and installed; even calibrated barrels have served successfully. It is only necessary to establish the weight of the

(*Continued on Page* 58)

Table I. Comparative evaporation based on actual weights of feed water

Scotch				Water-tube		
S1	S2			WT1	WT2	WT3
3	3	1	Number of tests averaged.	2	5	2
4	5	2	Moisture in coal, per cent.	5	3.3	5
8.38	9.5	3	Ash " " "	26.1	18.8	10.01
87.62	85.5	4	Combustible, " "	68.9	77.9	84.99
14200	14000	5	B.T.U. per lb. coal,		11790	
1.12	1.13	6	Factor of evaporation.	1.10	1.05	1.11
10.21	9.93	7	Water per lb. dry coal, lbs.	8.2	8.38	8.82
11.48	11.26	8	" " " " " " f.&a. 212°F.	9.05	8.96	9.80
78.01	77.6	9	Efficiency on dry coal, per cent.		72.6	
Hand	Hand	10	Firing	Stoker	Stoker	Hand
Howden	Howden	11	Draft	Induced	Positive	Natural
255	265	12	Stack temperature, deg. F	Unheated 590	Unheated 445	535
298	308	13	Draft "			

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Guns & Gunnery, Old Ironsides-III.

Historical Research on the Oldest Ship of the Navy —Interesting Facts on Her Cannons and Equipment

BY ELLIOT SNOW
Rear Admiral (C. C.) U. S. N., Retired

A LIST of the sea stores and outfits required to equip a man of war (like the CONSTITUTION) for a cruise, contains a host of objects whose names even have long since been discarded and forgotten. For instance, some of the spare parts and allowances were: paper cartridge formers, 1 to every 20 guns; wad formers, 1 to every 10 guns; gun breechings, 1 to every 2 guns; notch staffs, 1 to every 10 guns; fort fire staffs, 1 to every 20 guns; wads, 100 to every gun, 200 to bow and stern chasers; round shot, 100 to each gun, 200 to bow and stern chasers; stands of grape, 30 to the gun; canister, 20 to each gun; double-headed shot, 15 to each gun; longrange, 10 to each gun; bar shot, 10 to each gun. Innumerable articles like "powder horns"; "logger heads"; powder in quantity to correspond with the allowance of round shot; "match rope"; tomahawks; muskets, with buckshot, ball and blank cartridges; brass pistol molds; hog bristles, one half ounce to every 20 guns; gun and pistol flints; leather hose with copper pipe (nozzle) to each light room (near magazine). It is interesting here to note that each ship had to make its own ink for writing purposes; to this end it was allowed two papers of "ink powder." False fires, rockets, and colored lights were of course a necessary part of the signaling outfit. Just what the ship's "tinker" did with a "buck horn" must be left to the reader's research or imagination.

The cost of the guns, ammunition and military stores of the CONSTITUTION was $32,175. Among "the military stores requisite for the frigates" sent to Samuel Hodgdon by the war office, June 12, 1797, are listed: 44 blunderbusses, 300 boarding pikes, 120 battle lanthornes, 670 barrels of powder, 10,000 round shot for 24 pounders, 1600 chain and double headed shot for 24 pounders, 2200 round shot for 12 pounders, 720 double headed shot for 12 pounders, 900 stools of grape and canister shot for 12 pounders, 18 howitzers eight inch or of 4 or 6 pounders and 600 hand grenades.

It is probable that many of the *Sea Gunners Instructions* established at the Court of St. James on Jan. 7, 1730, affecting the handling of ammunition and the care of the battery of his Majesty's navy, were at first used in full by the navy of the United States and finally, with some developments, adopted and incorporated in *Marshall's Practical Gunnery*. We men of the sea borrow much from one another and hold on to old customs.

From the English *Sea Gunners Instructions* we learn

IV. That the powder in copper hooped barrels were lodged on the ground tier and last expended.

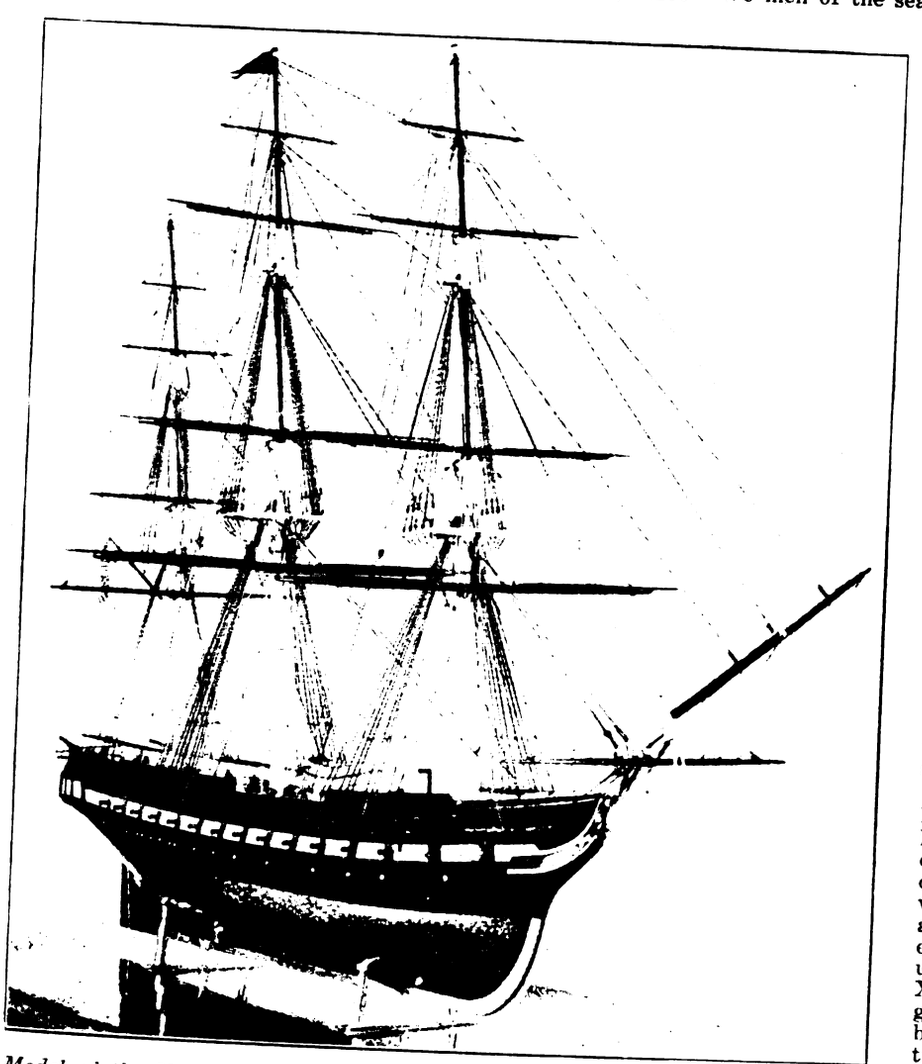
VII. That parchment cartridges were filled to not last above three weeks and but three rounds were kept filled at a time, paper being found more durable as well as less expensive.

X. That the gunner is not under any pretense to stave empty powder barrels but preserve them in order to shift such as may be decayed.

XI. That an allowance of five changes of powder and five shot was made once a month for the exercise of the upper deck guns.

XV. That the guns were not to be scaled oftener than necessary and when loaded for service were kept well tampioned and fidded at the vents with oakum.

XVI. That guns



Model of the U. S. S. Constitution, at Navy Yard, Washington. The battery is in full view. Note also the stowage of boats nested amidships and the captain's gig at the stern. The figurehead shown was not carried during the War of 1812. The Andrew Jackson figurehead was carried from 1834 to 1874

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struck into the hold for any reason were to be payed all over with a cost of warm tar and tallow mixed together, and a good full wad, dipped in the same a foot with the muzzle and a tampion well fixed therein, also a cork and oakum as well put into the vent to prevent their receiving damage.

XX. *That there will be placed on all cannons for sea service notches or sights on the base and second reinforced or muzzle rings, for horizontal and vertical directions, for the better guiding the aim; and the notches are to be marked with white lead.*

XXI. That it appearing by experience that double round shot, round and double headed shot or round and grape shot together are dangerous, and more to the detriment than good of the service, the gunner is to take care to prevent that practice in time of action, and to see that guns are not loaded with such mixtures; nor to suffer any iron grows to put into them.

XXII. That when there is occasion to cut up any cordage, breechings, tackles, muzzle lashings, port ropes or port-tackle falls * * * the lengths are to conform as set down etc. As to rope sponges, they are to be made out of old breechings of the same nature of guns.

Frugality in the use of Matches (lighted tow) was enjoined and no more than two were kept lighted at night to prevent a surprise attack. The matches, thus kept burning were hung over tubs of water to reduce the chance of fire. In comparison with the English practice of marking the "sea service notches or lights" with white lead on certain parts of the guns "for better guiding the aim," we know that the sighting arrangements on the guns of the CONSTITUTION were far in advance of those of the British. In Mr. Hallis' book *The Frigate Constition* we are told that the "Americans were clever enough to provide fair substitutes for modern sight bar. In some cases tubes were placed along the top of guns with adjustments for various elevation. Beside this her guns crews were more thoroughly drilled and under better control.

Long, long after the day of OLD IRONSIDES, the conservatism of those who go down to sea in ships prevented, for many years, the use of telescopic sight, from which our modern sights are derived. Small wonder is it then that when the guns of the CONSTITUTION spoke, it was with telling effect. "Why use sights at all?" asked some naval officers of her day. Lord Nelson, great a seaman as he was, objected to their use, and he is said to have remarked at one time, when a new plan for pointing guns was brought to his attention: "As to the plan for pointing a gun truer than we do at present, I shall of course look at it, or be happy if necessary to use it; but I hope we shall be able as usual to get so close to our enemy that our shot cannot miss the object."

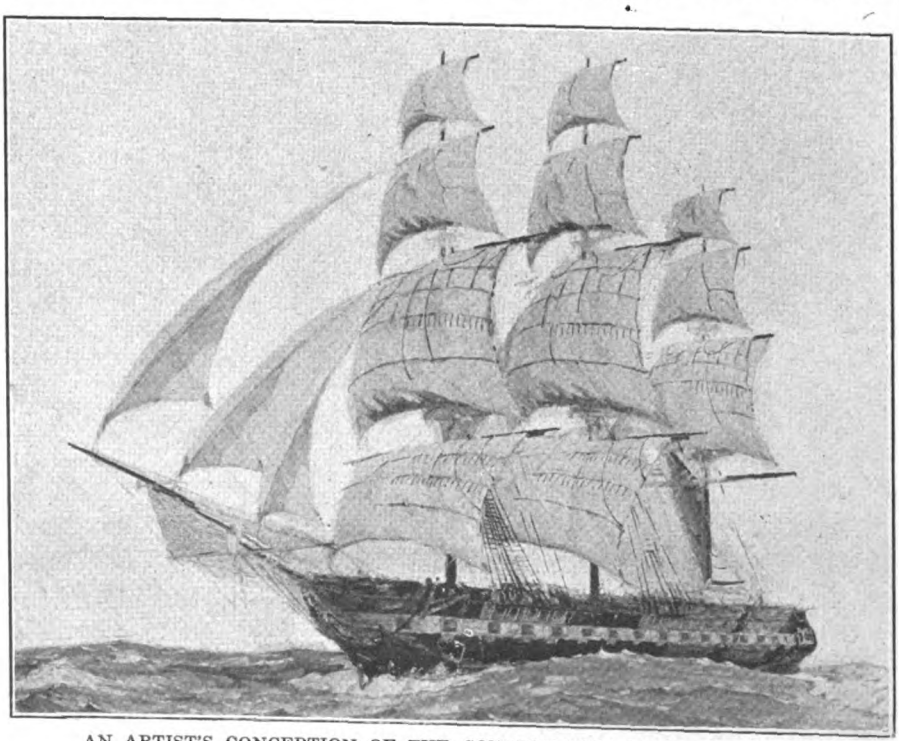
Then too, the frigate CONSTITUTION was a steadier gun platform and had her guns higher above water than the 44-gun frigates of the British and her battery though rated at (44) was in reality (54). The Yankees who designed, and built OLD IRONSIDES as a 44-gun frigate so contrived that she would safely carry 54 guns. Originally, 12 pounders were to have been a part of her battery as is shown by the letter from the war office to the governor of Massachusetts. At a much later date 42-pound carronades were under consideration for use on her spar deck but because of the weight, the idea of using them had to be abandoned.

From *Marshall's Practical Marine Gunnery* we may gather good and correct information as to the practice of the art of gunnery at the end of the eighteenth century. This book "was strictly examined by some of the most experienced officers of the United States navy," among whom was none other than Lewis Warrington. The author, in his preface, modestly says he is "an unlettered man" and even unacquainted with the "grammatical parts of the English language." Notwithstanding, he has left to posterity an interesting, valuable and well expressed record of gun design and gunnery practice in the days of 1812. That it does represent the practices of 1812 when the cannons of OLD IRONSIDES spoke so often is shown by the author's statement that "the notes from which the book was compiled, multiplied with increasing years." As the book left the hands of the printer in 1822, the period embraced by these "increasing years"

(*Continued on Page* 50)

Save the Constitution

A country wide campaign is now under way to raise the necessary funds to restore OLD IRONSIDES *and to maintain her as an historic shrine. Her officers and men in the early days of the Republic, who by their deeds of skill and daring established proud traditions for our navy, were recruited from the merchant marine. It is therefore particularly appropriate that the men of the American merchant marine of today should lend their material and moral support to save* OLD IRONSIDES. *This can be done by writing to the secretary of the navy, Washington.*



AN ARTIST'S CONCEPTION OF THE CONSTITUTION UNDER FULL SALE

This is part III and completes the article on the Guns and Gunnery of Old Ironsides. Parts I and II appeared in the October and December issues of MARINE REVIEW, respectively.

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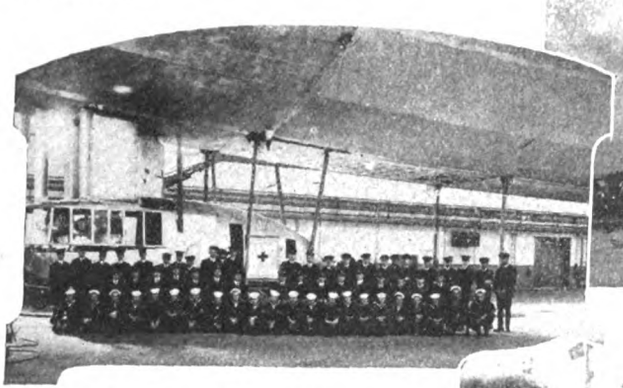
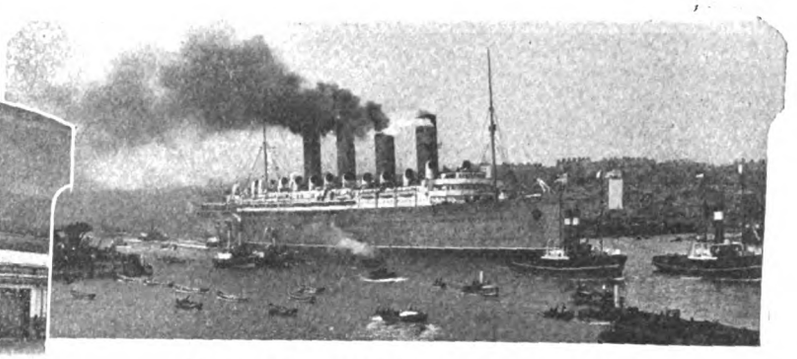
Latest Marine News in Pictures

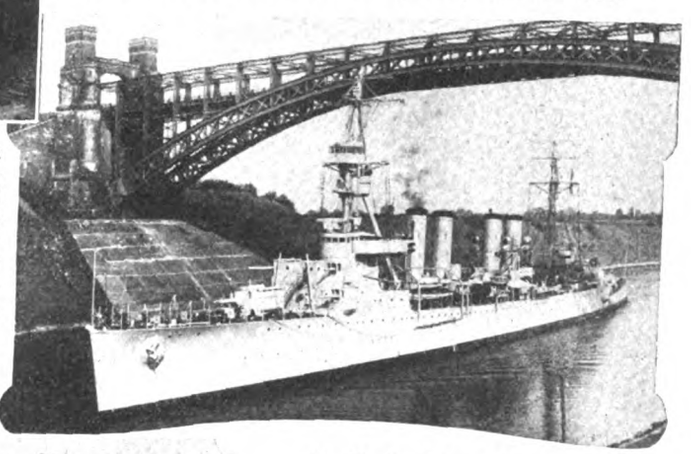
Crew of the ill fated Shenandoah taken in the hangar at Lakewood at a Red Cross roll call. The Shenandoah cabin is shown in the background.





Mauretania, leaving the Tyne on her completion in 1907 at Swan, Hunter & Wigham Richardson at Walsend. Thousands turned out to pay their respects to This epoch-making ship, an achievement in planning and workmanship. Then, 20 years ago and now the fastest Atlantic liner. Begun in the fall of 1904; launched Sept. 20, 1906; completed, fall of 1907.

A corner of the smoking room on the Leviathan. The carved oak figures represent old men of the sea. The glass cabinet added at Newport News, 1923.

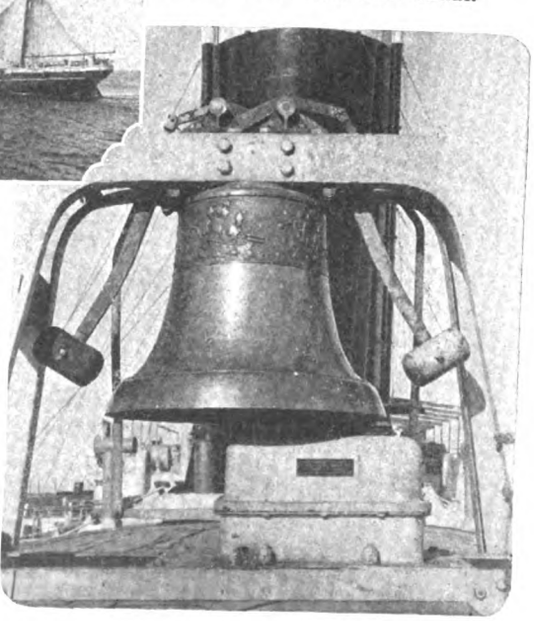


Canadian tug Donnelly, fitted for salvage work, a part of the fleet of the Donnelly, Salvage & Wrecking Co., Kingston, Ont.

U. S. S. Memphis, flagship of the navy in European waters, pays a courtesy call to Germany. This fine lined and efficient looking cruiser is shown beneath the Levensau bridge, Kiel canal.

The luxuriance of marine growth off the Southern California coast is shown by the heavily barnacled propeller and strut of destroyer in drydock, San Diego

Familiarity with types of sailing ships is disappearing. This beautiful example in line of hull and sail is a full rigged bark.



Leviathan bell a fine example of the molder's art.

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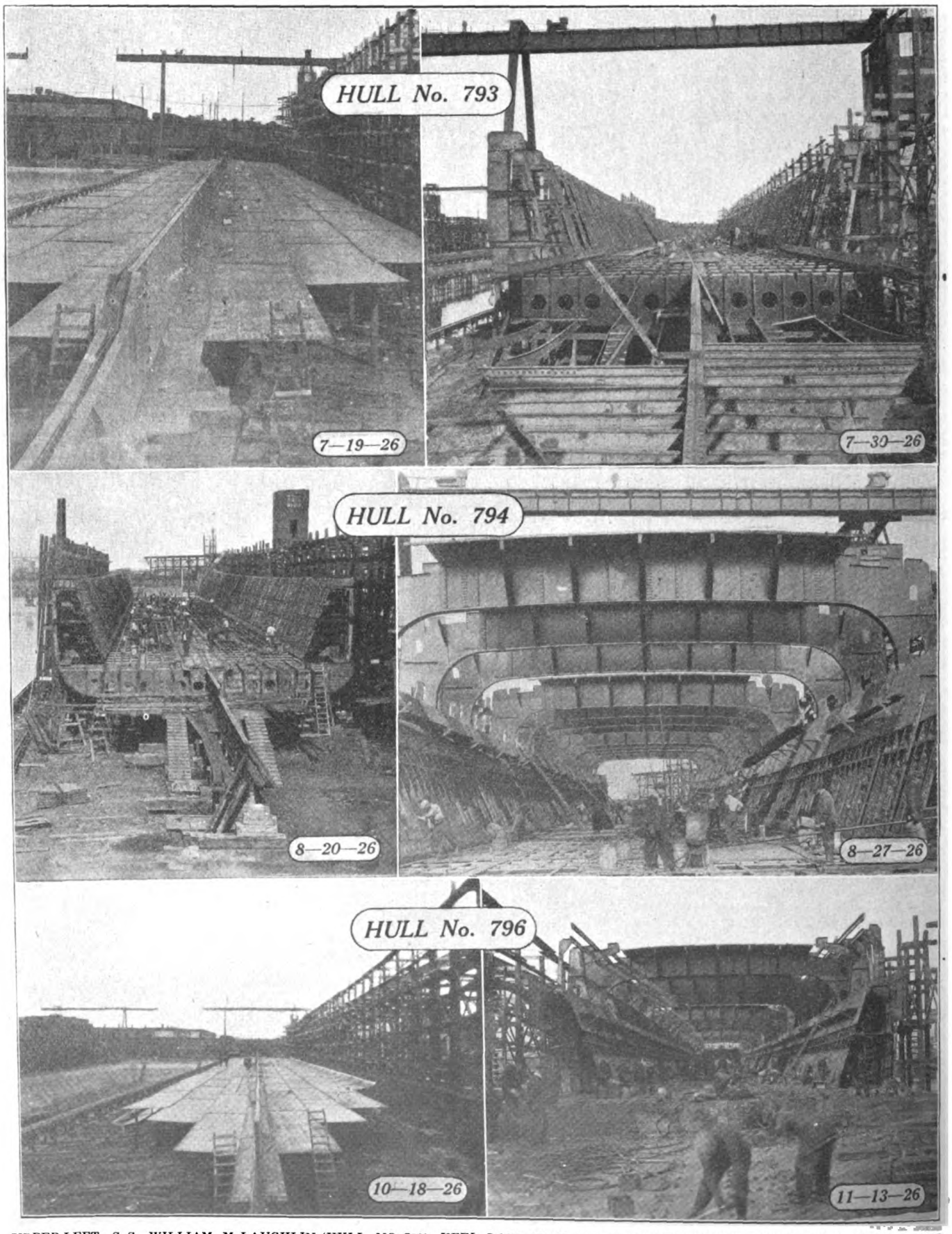
Build Lake Freight Vessels Quickly



UPPER LEFT—S. S. WILLIAM McLAUGHLIN (HULL NO. 793) KEEL LAID JULY 19, 1926—UPPER RIGHT— SAME HULL, JULY 30, 1926 SHOWING PROGRESS IN 11 DAYS—CENTER LEFT—S. S. ROBERT HOBSON (HULL NO. 794) AUG. 20, 1926. ELEVEN DAYS AFTER KEEL WAS LAID—CENTER RIGHT—SAME HULL AUG. 27, 1926—LOWER LEFT—S. S. GEORGE M. HUMPHREY (HULL NO. 796) KEEL LAID OCT. 18, 1926—LOWER RIGHT—SAME HULL, NOV. 13, 1926 WITH DECK ARCHES IN PLACE AND TANKS BEING PLATED

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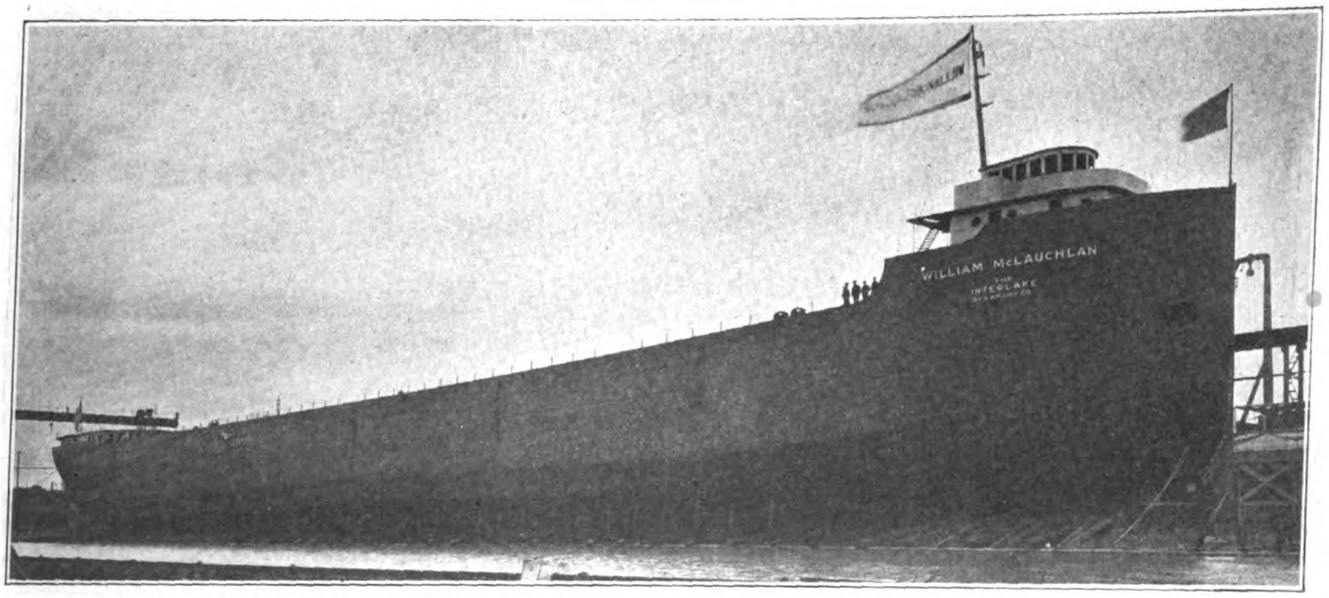


S. S. WILLIAM MCLAUCHLAN (Hull No. 793) launched Oct. 7, 1926 at Lorain, O., by the American Ship Building Co.

Great Lakes Shipyards Are Busy

Seven Large Bulk Cargo Steamers for Ore Trade and Two Self Unloaders for Stone Trade Under Construction

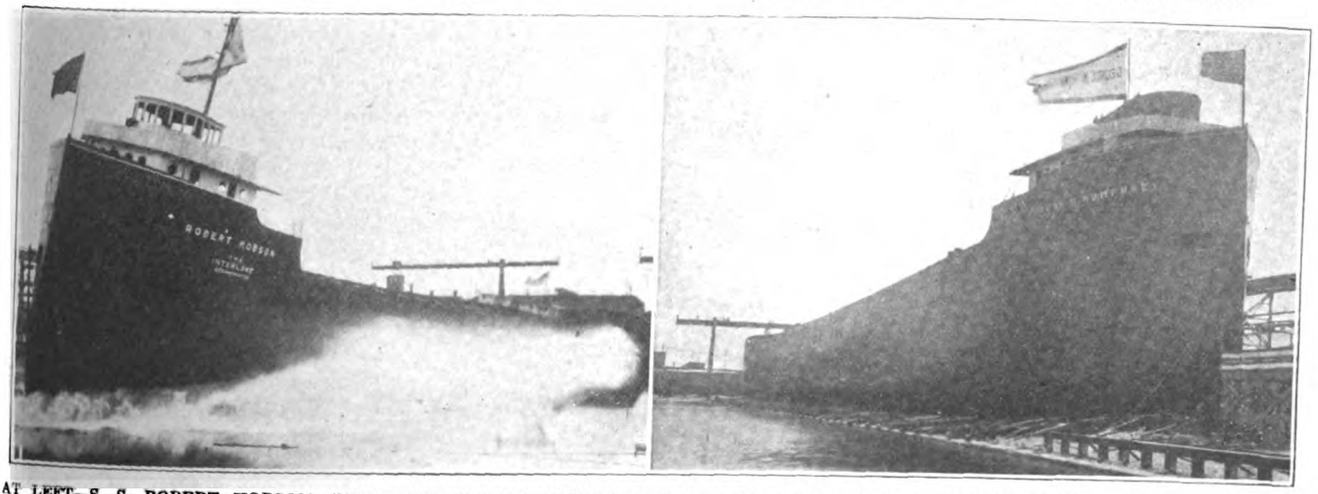
By A. H. Jansson

SHIPS ordered or now under construction in the principal American shipyards on the Great Lakes are listed in the accompanying table.

Shipbuilding on the Great Lakes may be said to be at this time more active than it has been since the great days following the war. There does not appear to be much encouragement, however, in looking about for definite sources of continued new work. But this is a condition which always has existed in shipbuilding, particularly on the Great Lakes.

No less than nine large bulk freighters are at present under construction in shipyards of the Great Lakes. Four of these vessels are due for delivery April 15, at the opening of navigation. The remaining five, it is expected, all will be delivered be-

Name of Vessel	Type	Launched	Owner
AMERICAN SHIP BUILDING CO.			
WILLIAM A. MCLAUCHLAN	Bulk freighter	yes	Interlake Steamship Co.
ROBERT HOBSON	Bulk freighter	yes	Interlake Steamship Co.
GEORGE M. HUMPHREY	Bulk freighter	yes	Kinsman Transit Co.
L. E. BLOCK	Bulk freighter	yes	Inland Steel Co.
HULL 797	Self-unloader	no	Bradley Transportation
HARRY COULBY	Bulk freighter	no	Interlake Steamship Co.
GREAT LAKES ENGINEERING WORKS			
HULL No. 255	Bulk freighter	no	Pittsburgh Steamship Co.
HULL No. 256	Self-unloader	no	Huron Transportation Co.
MANITOWOC SHIPBUILDING CORP.			
GRAND RAPIDS	Carferry	yes	Grand Trunk Railway
MADISON	Carferry	yes	Grand Trunk Railway
DREDGE	Diesel electric	no	Great Lakes Dredge & Dock Co.
TOLEDO SHIPBUILDING CO. INC.			
HULL No. 177	Carferry	no	Wabash Railroad Co.
HULL No. 178	Bulk freighter	no	Pittsburgh Steamship Co.



AT LEFT—S. S. ROBERT HOBSON (HULL NO. 794) LAUNCHED OCT. 30, 1926—AT RIGHT S. S. GEORGE M. HUMPHREY (HULL NO 796) LAUNCHED DEC. 30, 1926—BOTH VESSELS ARE BEING BUILT BY THE AMERICAN SHIP BUILDING CO., AT LORAIN, O.

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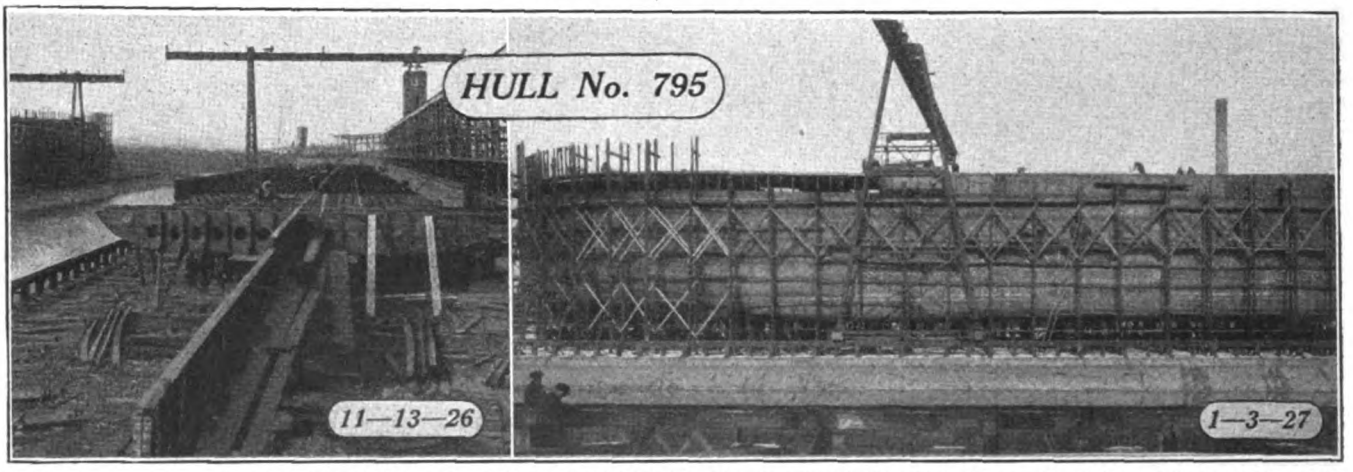

AT LEFT—S. S. L. E. BLOCK (HULL NO. 795) NOV. 13, 1926, FIVE DAYS AFTER KEEL WAS LAID—AT RIGHT—SAME HULL, JAN. 3, 1927—LAUNCHED FEB. 1, 1927—UNDER CONSTRUCTION BY THE AMERICAN SHIP BUILDING CO., LORAIN, O.

fore the end of the season of 1927, or by the middle of October.

Beyond this program the shipyards have nothing in sight. The policy of hand-to-mouth buying is firmly established in the shipbuilding industry.

New Vessels of Economical Size

Much may happen, however, to mature tentative or dormant plans on the part of vessel owners between now and the completion of this shipbuilding program. A survey of all the existing bulk cargo carriers on the Great Lakes would quickly show that many of these vessels still are of a smaller and consequently less economical older type. These vessels cannot move cargo at as low a cost per ton mile as the later modern steamers and consequently their replacement in due course is inevitable.

Details of all six bulk freighters under construction by the American Ship Building Co. are as follows:

S. S. William McLauchlan
(Hull No. 793)

S. S. Robert Hobson
(Hull No. 794)

Builder—American Ship Building Co., at Lorain, O.
Owner—Interlake Steamship Co., Cleveland.
Keels Laid—Hull No. 793, July 19, 1926; Hull No. 794, Aug. 9, 1926.
Launched—Hull No. 793, Oct. 7, 1926; Hull No. 794, Oct. 30, 1926.
Delivery—Both ships on or about April 15, 1927.
Dimensions—Length overall, 600 feet; length between perpendiculars, 580 feet; breadth molded, 60 feet. Depth molded, 32 feet; depth of water bottom, 5 feet 6 inches.
Hatches—Number, 18; spaced 24 feet between centers.
Cargo Holds—Four.
Main Engine—Triple expansion steam; cylinders, 24½ x 41 x 65 inches x 42 inches stroke.
Boilers—Three, Babcock & Wilcox water tube; steam pressure, 200 pounds per square inch; heating surface, 7965 square feet total; grate surface, 150 square feet total; Ellis & Eaves draft, with superheat.
Condenser—Surface type with steam jet air pump.
Propeller—One, four blades, cast steel, detachable; 15 feet in diameter by 14 feet 9 inches in pitch.
Ballast Pumps—Two centrifugal, engine driven, 14 inches in diamater; two vertical auxiliary reciprocating, 8 x 12 x 14 inches.

S. S. George M. Humphrey
(Hull No. 796)

Builder—American Ship Building Co., at Lorain, O.
Owner—Kinsman Transit Co., Cleveland.
Keel Laid—Oct. 18, 1926.
Launched—Dec. 30, 1926.
Delivery—On or about Feb. 16, 1927.
Dimensions—Length overall, 600 feet; length between perpendiculars, 580 feet; breadth molded, 60 feet; depth molded, 32 feet; depth of water bottom, 5 feet 6 inches.
Hatches—Number, 18; spaced 24 feet between centers.
Cargo Holds—Four.
Main Engine—Triple expansion steam; cylinders, 24½ x 41 x 65 inches x 42 inches stroke.
Boilers—Three Scotch, 14 feet in diameter by 11 feet long; steam pressure, 185 pounds per square inch; heating surface, 7155 square feet total; grate surface, 148.5 square feet total; Ellis & Eaves draft; no superheat.
Condenser—Surface type with steam jet air pump.
Propeller—One, four blades, cast steel detachable; 15 feet in diameter by 14 feet 9 inches pitch.
Ballast Pumps—Two centrifugal, engine driven, 14 inches in diameter; two vertical auxiliary reciprocating, 8 x 12 x 14 inches.

S. S. L. E. Block
(Hull No. 795)

Builder—American Ship Building Co., at Lorain, O.
Owner—Inland Steamship Co., Chicago.
Keel Laid—Nov. 8, 1926.
Launched—To be launched on or about Jan. 29, 1927. (Launch set for Feb. 1.)
Delivery—On or about March 18, 1927.
Dimensions—Length overall, 620 feet; length between perpendiculars, 596 feet; breadth molded, 64 feet; depth molded, 33 feet; depth of water bottom, 5 feet 6 inches.
Hatches—Number, 18; spaced 24 feet between centers.
Cargo Holds—Three.
Main Engine—Triple expansion steam; cylinders, 25½ x 41 x 67 inches x 42 inches stroke.
Boilers—Three Scotch, 14 feet 6 inches in diameter by 11 feet long; steam pressure, 185 pounds per square inch; heating surface, 7856 square feet total; grate surface, 148.5 square feet total; Ellis & Eaves draft with superheat.
Condenser—Jet type with Edwards air pump.
Propeller—One, four blades, cast steel, detachable, 15 feet 3 inches in diameter by 14 feet pitch.
Ballast Pumps—Two centrifugal, engine driven, 15 inches in diameter; two horizontal auxiliary reciprocating, 10 x 12 x 16 inches.

Bradley Self Unloader
(Hull No. 797)

Builder—American Ship Building Co., at Lorain, O.
Owner—Bradley Transportation Co., Rogers City, Mich.
Keel Laid—Jan. 10, 1927.
Launched—On or about March 27, 1927.
Delivery—On or about July 1, 1927.
Dimensions—Length overall, 638 feet; length between perpendiculars, 615 feet; breadth molded, 33 feet; depth of water bottom, 3 feet 9 inches.
Hatches—Number, 17; spaced 24 feet between centers.
Cargo Holds—Three.
Main Engine—Turboelectric, with electric motor driving single propeller.
Boilers—Two, Babcock & Wilcox water tube; Westinghouse automatic stokers, underfeed; induced and forced draft.
Condenser—Surface type with steam jet air pump.

S. S. Harry Coulby
(Hull No. 798)

Builder—American Ship Building Co., at Lorain, O.
Owner—Interlake Steamship Co., Cleveland.
Keel Laid—On or about Feb. 7, 1927.
Launched—On or about April 23, 1927
Delivery—On or about July 1, 1927.
Dimensions—Length overall, 630 feet; length between perpendiculars, 607 feet; breadth molded, 65 feet; depth molded, 33 feet; depth of water bottom, 5 feet 6 inches.
Hatches—Number, 18; spaced 24 feet between centers.
Cargo Holds—Four.
Main Engine—Triple expansion steam; cylinders, 25½ x 41 x 67 inches x 42 inches stroke.
Boilers—Three, Babcock & Wilcox water tube; steam pressure, 215 pounds per square inch; heating surface, 9345 square feet total; grate surface, 190 square feet total; Ellis & Eaves draft with superheat.
Condenser—Surface type with steam jet air pump.
Propeller—One, four blades, cast steel, detachable; 15 feet, 3 inches in diameter by 14 feet in pitch.
Ballast Pumps—Two centrifugal, engine driven, 14 inches in diameter; two vertical auxiliary reciprocating, 10 x 14 x 16 inches.

The only special types of vessels not bulk freighters being built at present in shipyards of the Great Lakes are three carferries, two at the Manitowoc Shipbuilding Corp. and one at the Toledo Shipbuilding Co. Inc. One of the nine bulk carriers under construction is to be of a special type in the sense that it will be built to carry stone and will have machinery for unloading herself. This vessel is to be built by the Great Lakes Engineering Works of Detroit for the Huron Transportation Co., Detroit, a subsidiary of the Huron Portland Cement Co. She will be slightly larger but generally similar to the steamers JOHN W. BOARDMAN and SAMUEL MITCHELL of the same company.

Another very unusual and special

(*Continued on Page* 56)

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Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review
By Harry Bowne Skillman
Attorney at Law

A MOTORBOAT, enrolled and licensed as a pleasure yacht, caught after a chase by the coast guard and found laden with 400 cases of liquors, was subject to forfeiture as engaged in the transportation of merchandise for pay.—HERRESHOFF, 6 F. (2d) 414.

* * *

A WHARFINGER, who maintains a wharf on which to receive goods consigned to himself, ... is under exactly the same duty to exercise care and skill, according to the circumstances, in giving boats which deliver cargo at his wharf a safe berth, as is a wharfinger who maintains a wharf only for the purpose of collecting wharfage."—Kenny v. Balbach Smelting & Refining Co., 6 F. (2d) 671.

* * *

WHERE a neutral ship, bound for a neutral port, was detained by the British government in war time and allowed to proceed only on agreement of the owner to return a part of the cargo for action of the prize court, such action, it was held in the case of Furness Shipping & Agency Co. v. Barber & Co., Inc., 6 F. (2d) 779, amounted to a seizure of the property.

* * *

THE master of the vessel is, in the performance of his duty, required to exercise reasonable care for the safekeeping of the goods intrusted to him. It did not cease when the goods left his vessel. If it was necessary to store them, ... it was likewise necessary to care for them while in storage. The exercise of this reasonable care, devolving upon the master, required such steps as the demands of safekeeping required."—Furness Shipping & Agency Co., Inc. v. Barber & Co., Inc., 6 F. (2d) 779.

* * *

A SHIP chartered to carry a full cargo for a single shipper, it was held in NORDHVALEN, 6 F. (2d) 883, is not a common carrier. "She was not an insurer of the safety of the cargo," said the court, "but merely a bailee to transport for hire, and, as such, only bound to use ordinary care. The mere fact of loss did not throw upon the vessel, as would have been the case with a common carrier, the burden of showing that she was seaworthy before she broke ground, and that the loss occurred from one of the causes excepted in the contract of shipment."

A CARRIER vessel under embargo may declare a contract of carriage off because of impossibility of performance when that impossibility appears.—HENRY W. CRAMP, 6 F. (2d) 900.

* * *

PORT to port passing is a normal and proper navigation. A vessel is not entitled to assume that another vessel will pass her starboard to starboard until two whistles are blown and answered.—BILBSTER, 6 F. (2d) 954.

* * *

BARGES in hawser tiers are expected to be strong enough, if in a seaworthy condition, to withstand the strains of such towing.—McGee v. Davis, 6 F. (2d) 959.

* * *

A MARITIME lien will arise for wharfage furnished to a ship at the request of any one authorized to bind the ship, said the court in CAPITAINE FAURE, 7 F. (2d) 131. Speaking further: "The wharf in question was a privately owned wharf, the owners were not bound by any rates fixed by statute, but could make any rate which was satisfactory to the contracting parties, but such contract could not bind the ship, unless the one hiring the wharf had authority to bind the ship."

* * *

NEGLIGENT failure to observe the condition of thermometers for recording temperatures in refrigerator compartments, and so to control temperatures therein, resulting in the freezing of a shipment, was not a fault in the management of the vessel, for which a ship is excused by section 3 of the Harter act, but negligence in not properly caring for the cargo, for which it is liable.—SAMLAND, 7 F. (2d) 155.

* * *

A TUG, which towed a schooner to a pier in a slip, and which directed where lines should be run, was not liable for injury to scows on the opposite side of the slip when she careened at low water, though the tug left her docked with her crew on board, and did not warn her that she would take the ground at tide fall.—N. Y. MARINE No. 3 7 F. (2d) 608.

* * *

A SEAMAN, incapacitated during a voyage to a particular port by illness in the service without fault on his part, was entitled to recover wages to the end of his contract, in addition to maintenance and care up to that time.—Enochasson v. Freeport Sulphur Co., 7 F. (2d) 674.

* * *

LIBELANT, failing to free a stranded vessel, can recover salvage only by showing its efforts contributed to a successful result.—Lincoln Steamship Line, Inc., v. United States, 7 F. (2d) 886.

* * *

FAILURE of the captain of a boat to attempt to rescue a member of the crew known to have fallen overboard was negligence which was imputable to the owner of the boat, who was liable to dependent relatives of the member of the crew for pecuniary loss sustained by them by reason of his death.—Salla v. Hellman, 7 F. (2d) 953.

* * *

STEAM vessels have no right to give passing signals except when they are in sight of each other, fog signals only being permissible in fog when they cannot see each other.—Managua Navigation Co. v. Aktieselskabet Borgestad, 7 F. (2d) 990.

* * *

NO LIEN can be acquired for supplies furnished after the seizure of a vessel by the United States marshal in admiralty proceedings.—CULGOA, 8 F. (2d) 62.

* * *

WHERE title to barges, sold under conditional bill of sale, did not pass, seller, on damage to barges, was entitled to have proceeds of insurance policy, payable to him as his interest might appear, paid to repairmen, and applied in payment of claim against such barges, rather than on other indebtedness of purchaser to repairmen, whom it was shown knew that payment represented proceeds of policies and belonged to seller.—EDDIE, 8 F. (2d) 63.

* * *

FAILURE to note in bills of lading the insufficiency of containers did not estop steamship from asserting such insufficiency as the cause of the damage to the goods, as against consignees suing the steamship for damage thereto.—ISLA DE PANAY, 8 F. (2d) 91.

* * *

AN UNJUSTIFIABLE deviation by a ship vitiates or avoids the contract of carriage, and the failure to comply with what in effect is a condition or warranty not to deviate displaces it; the carrier is deprived of the benefit of an insurance clause in the bill of lading.—Rosenberg Bros. & Co., v. United States Shipping Board Emergency Fleet Corp. 7 F. (2d) 893.

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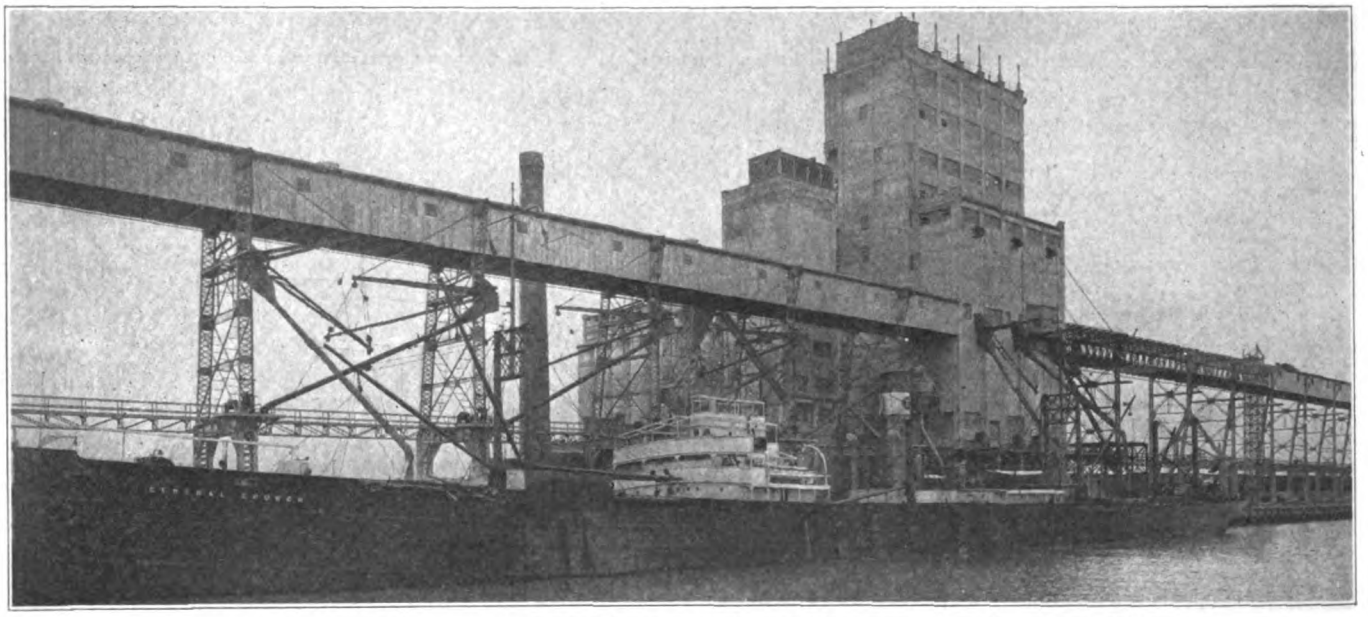
Dock Management Progress Section

How Successful Dock Operators Have Met Problems of Giving Best Service to Ships



Grain elevator at Norfolk erected by the city at a cost of $1,400,000 to diversify port facilities

Norfolk Has Modern Terminal Facilities for Foreign Trade

BY CHARLES H. HOOFNAGLE

AMONG the fast growing ports of the Atlantic coast, Norfolk, the famous harbor of Hampton Roads occupies high rank. Norfolk is situated midway of the coast and 15 miles from the Virginia capes.

The tonnage of this port has increased more than tenfold in the last decade, and its possibilities for the future are indicated by the fact that every ship which entered and cleared during the entire year of 1925 could anchor in its waters at one time without causing congestion.

The modern export, import and coastwise terminals at Norfolk are capable of serving all types of vessels expeditiously, and they are served by a belt line railroad which transportation experts have declared to be one of the most valuable assets possessed by any port or city in the country.

Hampton Roads, which includes not only Norfolk, but Portsmouth and Newport News as well, has many advantages that make it the finest harbor on the Atlantic coast and one of the two or three best in the entire world.

The port is open the year round, is free from ice, dangerous currents and strong winds, and affords a safe anchorage for an unlimited number of vessels. In fact, it could accommodate the combined navies of the world simultaneously without congestion. There is a tidal range of only two and one-half feet, and a depth ranging from thirty to forty feet and upward.

Forty Feet Depth of Water

The channels to Norfolk-Portsmouth have been improved to a depth of forty feet at mean low tide, seven hundred and fifty feet wide. The Thimble Shoals channel, lying between Hampton Roads and the sea (lower Chesapeake bay and the Atlantic ocean), has a controlling depth of forty feet at mean low tide, and is seven hundred and fifty feet wide.

Hampton Roads proper, not including the deep water extent of the Elizabeth, James and Nansemond rivers, has an area of forty-one square miles, with extensive frontage having ready access to deep water. The natural configuration of the shore line, interrupted as it is by a number of branching estuaries, has operated to reduce the possibility of the concentration of waterfront ownership in the hands of a few, and has obviated the necessity for crowded terminal development within a restricted zone.

The waterfront of Norfolk-Portsmouth harbor approximates 36 statute miles in length, all located along improved channels. Continuations of the improved channels upon which harbor lines have been established are being used for industrial purposes.

The people of the Hampton Roads

The author, Charles H. Hoofnagle is director of the Norfolk-Portsmouth News bureau.

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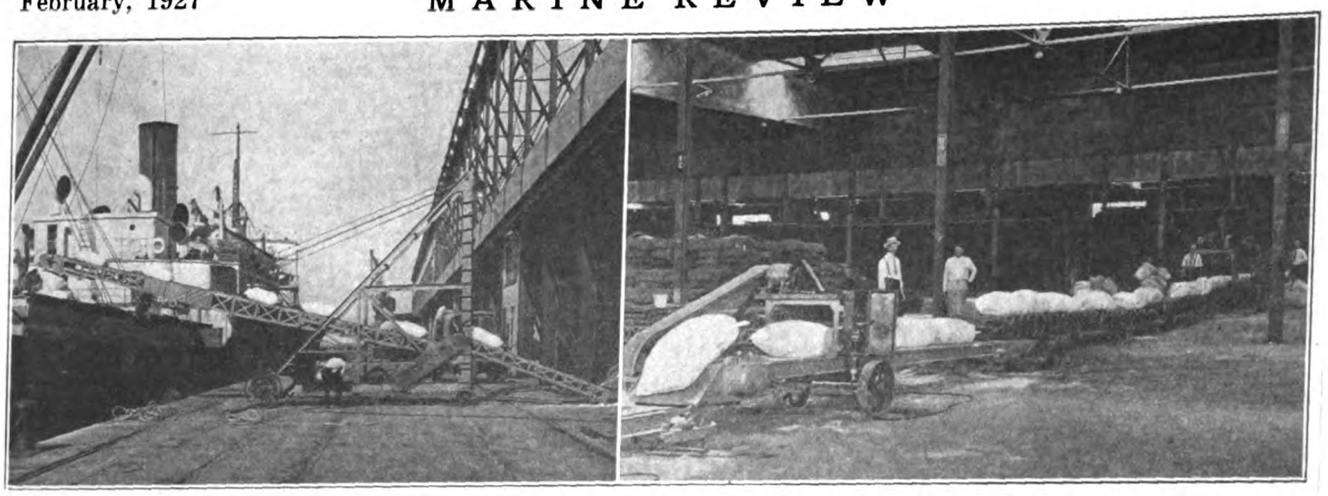

PIER AT NORFOLK, VA., OPERATED BY THE NORFOLK TIDEWATER TERMINAL—MODERN EQUIPMENT FOR LOADING SHIPS BY MECHANICAL MEANS FROM RAILROAD CARS TO SHIP—BAGS OF FLOUR IN CONTINUOUS MOTION ACROSS PIER AND OVER INCLINE TO SHIP'S DECK

cities have in the last decade by their progressive efforts created a port condition that has resulted in manifold increase in foreign trade. The result is that today, with ample terminal facilities, unexcelled rail transportation, general cargo service to every quarter of the globe and a geographic situation excelled by no port on the American continent, Hampton roads has become one of the vital factors in the commerce of this country.

Eight Trunk Line Railways

Eight trunk line railways center at the port and are linked on the Norfolk side by the Norfolk & Portsmouth belt line, owned jointly by the roads. This belt line provides for efficient interchange of traffic from one road to another, serves industries and commercial establishments and connects with steamship terminals. It serves directly Norfolk's municipal piers, now under lease to Norfolk Tidewater Terminals Inc., and the municipal grain elevator operated by the city. On all through and line haul traffic, the switching charges of the belt line are absorbed in the Norfolk rate.

Hampton Roads has been bound up intimately with nearly all the principal events in the nation's history. Its environs hold a place unequaled in connection with the creation of the Republic, and in fact attained a prominent position long before independence was dreamed of. It was at Cape Henry that the earliest party of permanent English settlers made its first landing in the New World before proceeding to Jamestown to establish the colony there. From Cape Henry the little fleet, with Capt. John Smith on board, sailed to the entrance of Chesapeake bay and into the sheltered, land-locked waterway, and thence up the James river.

The famous harbor was a scene of action during the Revolution, and it was in these waters during the war between the states that the battle was fought between the ironclad MERRIMAC and MONITOR—the battle which revolutionized naval warfare.

But Hampton roads today is a center of very different activities. With great vessels plying to and fro, its total commerce for 1924 was 15,773,069 long tons, while the foreign commerce for the same year was 4,145,752 tons.

Exports Have Increased Tenfold

A comparison of the value of exports moving through Hampton roads shows the following figures: For 1914, $15,162,855; for 1925, $168,664,547. The export commodities consist principally of tobacco, coal, cotton, grain, lumber, apples and vegetables and a large assortment of miscellaneous articles such as evaporated milk, cotton hosiery, piece goods, underwear, vegetable oil, refined cop-

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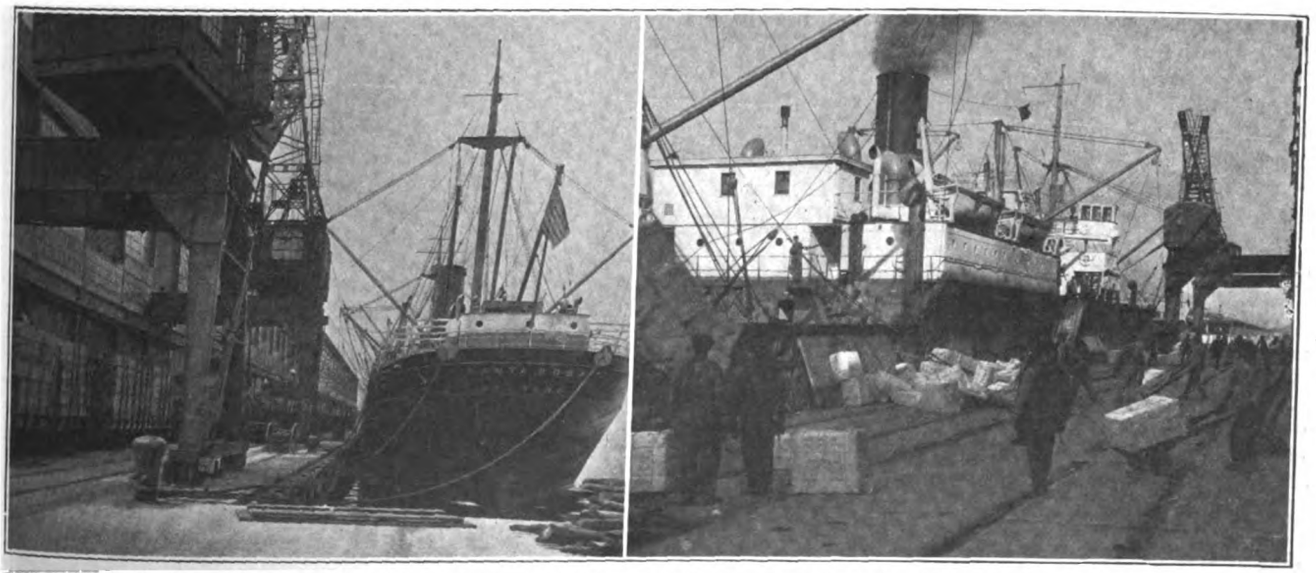

TIDEWATER TERMINAL PIER AT NORFOLK—AT LEFT—LUMBER TRANSFERRED FROM FLAT CARS TO SHIP FOR EXPORT—AT RIGHT—LOADING WOOD PULP

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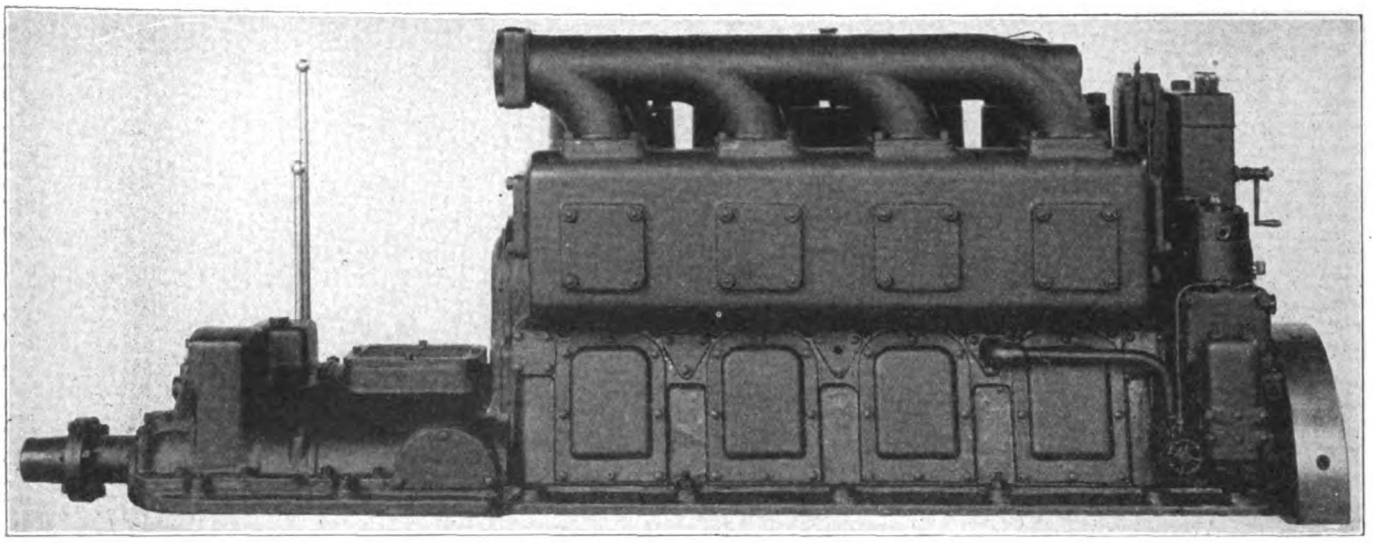


Exhaust side 40-Horsepower Marine Diesel Engine—Built-in Circulating and Bilge Pump and Air Compressor

Smaller Diesel Engines Developed

Build Two-Cycle Diesels of 10 H. P. Per Cylinder Suitable for Direct Drive—Also Generating Sets as Auxiliaries

BY R. H. BACON

IMPROVEMENTS in the design and construction of diesel engines have been unusually rapid during the past few years. That this development has reached the small engine field is shown by the fact that Fairbanks-Morse has recently announced a line of diesel engines in a 10-horsepower cylinder size operating at a speed of 650 revolutions per minute. This new line is suitable for direct drive for use in small craft and also in diesel generating sets for use as auxiliaries in connection with the main propulsion engines. The new engine is already available in the two and four-cylinder sizes, which are rated at 20 and 40-horsepower, and in the generating sets which are rated at 18 and 36 kilowatts, and it is expected that the 30-horsepower unit and 27-kilowatt generating set will be brought through shortly. The generating sets operate at a speed of 800 revolutions per minute.

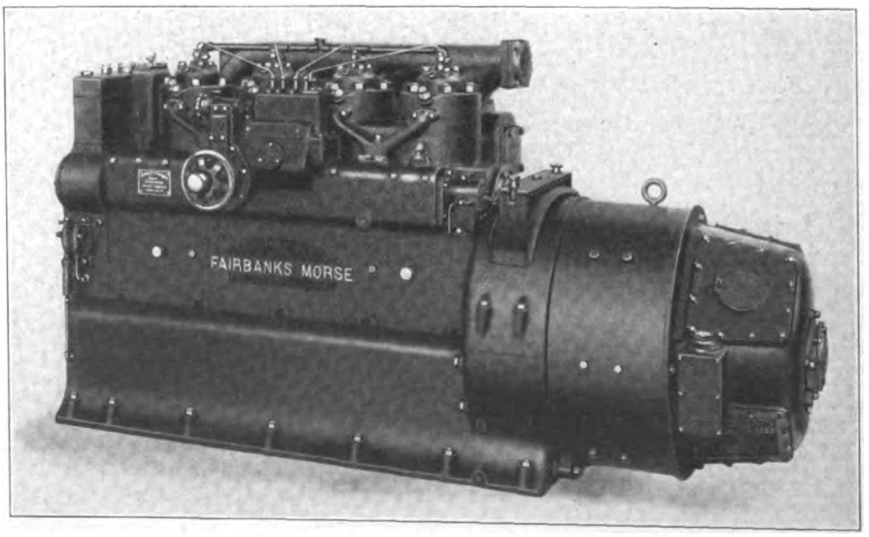
There is no question but what this new small diesel is one of the most outstanding developments in diesel engine engineering. It makes available for the first time the simplicity of the two-cycle engine in small engines which have all of the refinements of the largest diesel engines. Although the new engines follow in general principle the lines of the 60 to 360-horsepower series which are described in the February 1926 issue of MARINE REVIEW they have a number of interesting features because of their smaller size and higher speed.

In order to secure the maximum compactness the cylinders are cast en-bloc. This construction simplifies the design in many ways. Water piping of any kind is entirely unnecessary and the exhaust header is applied in a very simple manner. It increases the rigidity of the entire assembly and at the same time reduces the weight in pounds per horsepower. In many cases small engines are set on foundations which are not rigid. This rigidity of the construction then becomes an important factor in maintaining bearing alignment.

Lubrication and Simplified Control

Other important features of the engine include complete automatic lubrication, a simplified control which is arranged for both manual operation and for governor control and a built-in transmission. The lower base is of sturdy construction with heavy transverse bridges which form the main bearing supports. At the forward end of the lower base is a compartment which houses the gear which drives the lay shaft and the eccentric which drives the built-in air compressor and circulating and bilge pumps. This compartment also forms a sump for clean lubricating oil.

In arranging for the drive for the built-in compressor and circulating bilge pumps the designers have used a very ingenious arrangement. The



36-KILOWATT MARINE DIESEL ENGINE GENERATING SET

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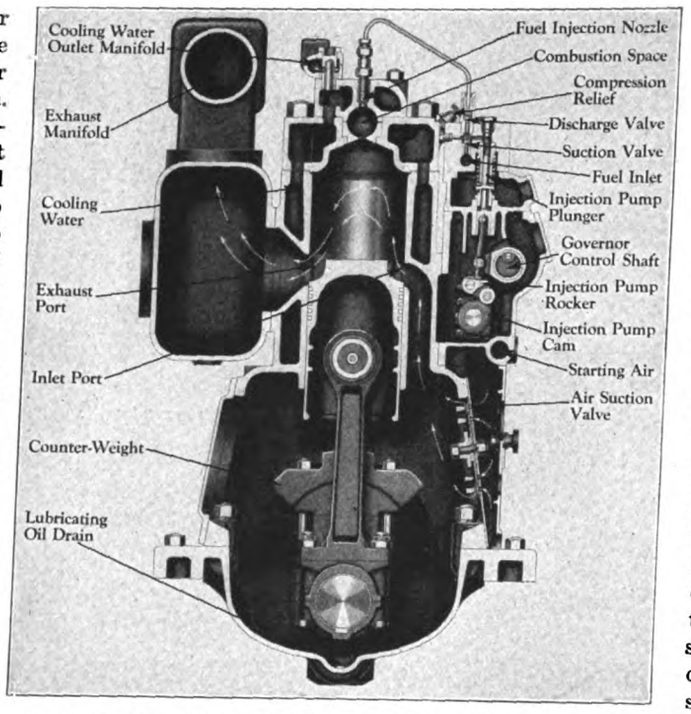
eccentric actuates a rocker arm which in turn drives the piston of the compressor through a link connection. The piston rod of this compressor is extended so that it becomes the piston rod for the pump. This pump is double acting with two sets of valves, one side of the pump being used for circulating water and the other side as a bilge pump. This arrangement is a very simple one, compact and yet accessible.

The shaft which carries the idler gear of the lay shaft train also carries an eccentric which drives two plunger lubricating oil pumps. One of these pumps takes its suction from the crank case compartment previously mentioned and pumps the oil under pressure to the lay shaft bearings and to such rockers, rollers and pins that go to make up the injection and governor pump drives and the compressor and pump drives. The other pump takes the oil from the individual crank case of each cylinder and pumps it to the filter. Since the oil used in engines of this rating is a comparatively small amount, the filtering can be handled in batches and the oil is poured back into the main lubricating sump or to the force-feed lubricator, thus always insuring clean oil.

This force-feed lubricator lubricates the piston pin and the cylinders. The crank pins and main bearings are also lubricated by force-feed lubrication from this lubricator. It can be seen from this brief description, therefore, that every part of the engine is automatically lubricated.



SECTION THROUGH CYLINDER OF 20-HORSEPOWER 2-CYCLE AIRLESS INJECTION DIESEL ENGINE

In order to get a really good idea of the unusual flexibility of this engine it is necessary to see it in operation and to actually manipulate the controls. The control is simple and yet it functions so perfectly that the engine will throttle down to a very low speed and when the manual control is opened suddenly it comes up to speed in the same way that a high grade automobile engine speeds up when the throttle is suddenly opened. The individual cams which operate the fuel pumps and the air starting valves are mounted on the lay shaft which is driven by the gear train previously mentioned. The governor is also driven by a worm gear from this lay shaft. There is one important difference in the fuel injection scheme which is used with this line of engines and that which is used in other Fairbanks-Morse diesels. The amount of fuel injected is controlled by the length of the injection pump plunger stroke and not by the closing of the suction valves. The suction valves are automatic in their operation, that is, they open and admit fuel to the barrel of the injection pump on the down stroke of the plunger. The stroke of the plunger is regulated through a very simple linkage arrangement. The governor control shaft, as shown in the accompanying transverse section of the engine, is pivoted eccentrically so that any movement of the governor weights tends to move the pump plunger push rod with respect to the cam operated rocker arm. The position of the push rod on this rocker determines the amount of fuel injected by the pump

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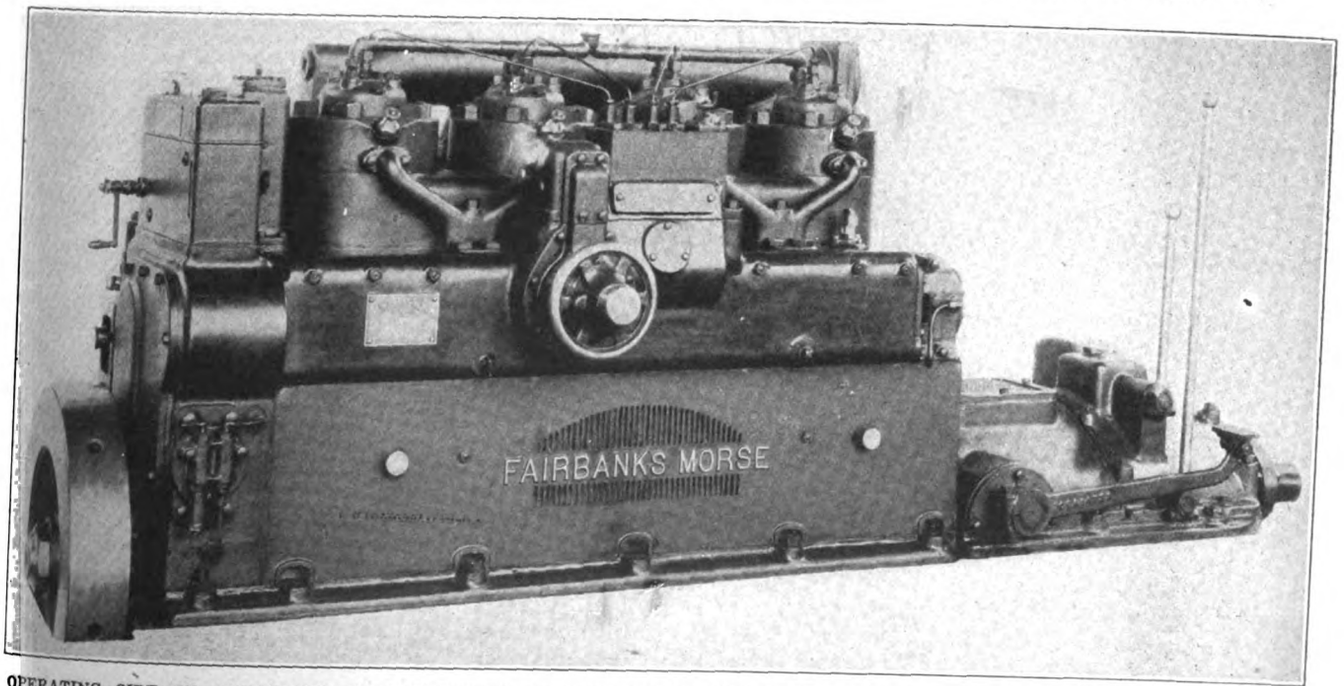

OPERATING SIDE OF 4-CYLINDER 40-HORSEPOWER MARINE DIESEL ENGINE WITH EN-BLOC CYLINDERS—SIMPLE AND COMPACT

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Personal Sketches of Marine Men

Ernest M. Bull, President, A. H. Bull & Co.

By E. C. Kreutzberg

HE HAS had nearly thirty years of experience as a ship operator and is thoroughly familiar with shipping conditions.

UNDER his direction the line founded by his father has grown into a large and successful enterprise giving good service to shippers.

HIS faith in the future of America's destiny on the seas in both foreign and domestic trade is firmly rooted and cannot be shaken.

BORN in Elizabeth, N. J., in 1875, Ernest M. Bull received his first vivid impression of the shipping business at the age of 10. His father, the late A. H. Bull, in 1885 organized a steamship line to Porto Rico afterward known as the New York & Porto Rico Steamship Co., and to raise every dollar possible for investment in this line, he not only borrowed to the limit of his ability but mortgaged his home and cut down the family budget to the minimum. Young Ernest was attending private school and, as part of the program of economy, was forced to forego this luxury and go to public school. Later, when his father again was more comfortably circumstanced, the boy was allowed to go to Pingry school at Elizabeth. From there he went to Cornell, graduating with the degree of bachelor of science in 1898.

As Ernest M. Bull's career is an extension of that of his illustrious parent, it is necessary to indulge in a bit of history. Back in 1864 A. H. Bull, then a boy of 16, was attending school in Brooklyn when word was received that his father, Col. James H. Bull, had been shot and killed at the battle of Fredericksburg. A. H. Bull's schooldays ended abruptly. He crossed the Wall street ferry and went from office to office on South street seeking employment. As a result, he met J. Ernest Miller, one of the best known shipping men of that day, and went to work for the firm of Miller & Houghton as office boy at a salary of $1 per week. He advanced rapidly and in a few years had been admitted to partnership. Later, when this firm split up, J. Ernest Miller, A. H. Bull and Henry T. Knowlton, organized as Miller, Bull & Knowlton, doing a general ship brokerage business, and engaging particularly in the schooner trade with the West Indies.

In organizing the steamer line to Porto Rico, which grew into the New York & Porto Rico Steamship Co., A. H. Bull demonstrated the courage and the faith in American shipping which characterized him all through his career. As a result of the strenuous financing methods alluded to above, he was able to take a third interest in the line, which made him the largest single stockholder. Two ships were built, the PONCE and the SAN JUAN. Miller, Bull & Knowlton acted as agents for the new line and everything went along well until 1899. At that time an issue developed between the various interested parties and this resulted in an agreement whereby Miller, Bull & Knowlton were either to buy the other holdings in the New York & Porto Rico line or sell out their holdings. A. H. Bull failed in his efforts to finance the purchase of the other holdings and as a result sold out his interest to J. E. Berwind, with an agreement that he would not resume activity in the regular steam trade to Porto Rico for a period of 10 years.

In the meantime, Ernest M. Bull had entered the shipping business. Following his graduation from Cornell in 1898, he went to work for Miller, Bull & Knowlton, and was sent to Porto Rico to familiarize himself with the details of the business there. In 1899 the firm of A. H. Bull & Co. was formed as successors to Miller, Bull & Knowlton. This was a partnership in which A. H. Bull, Wm. H. R. Killeen and Ernest M. Bull held interest. In 1917 A. L. Burbank became a member of the firm. This new firm did a general shipping business as brokers and owners of schooners and two

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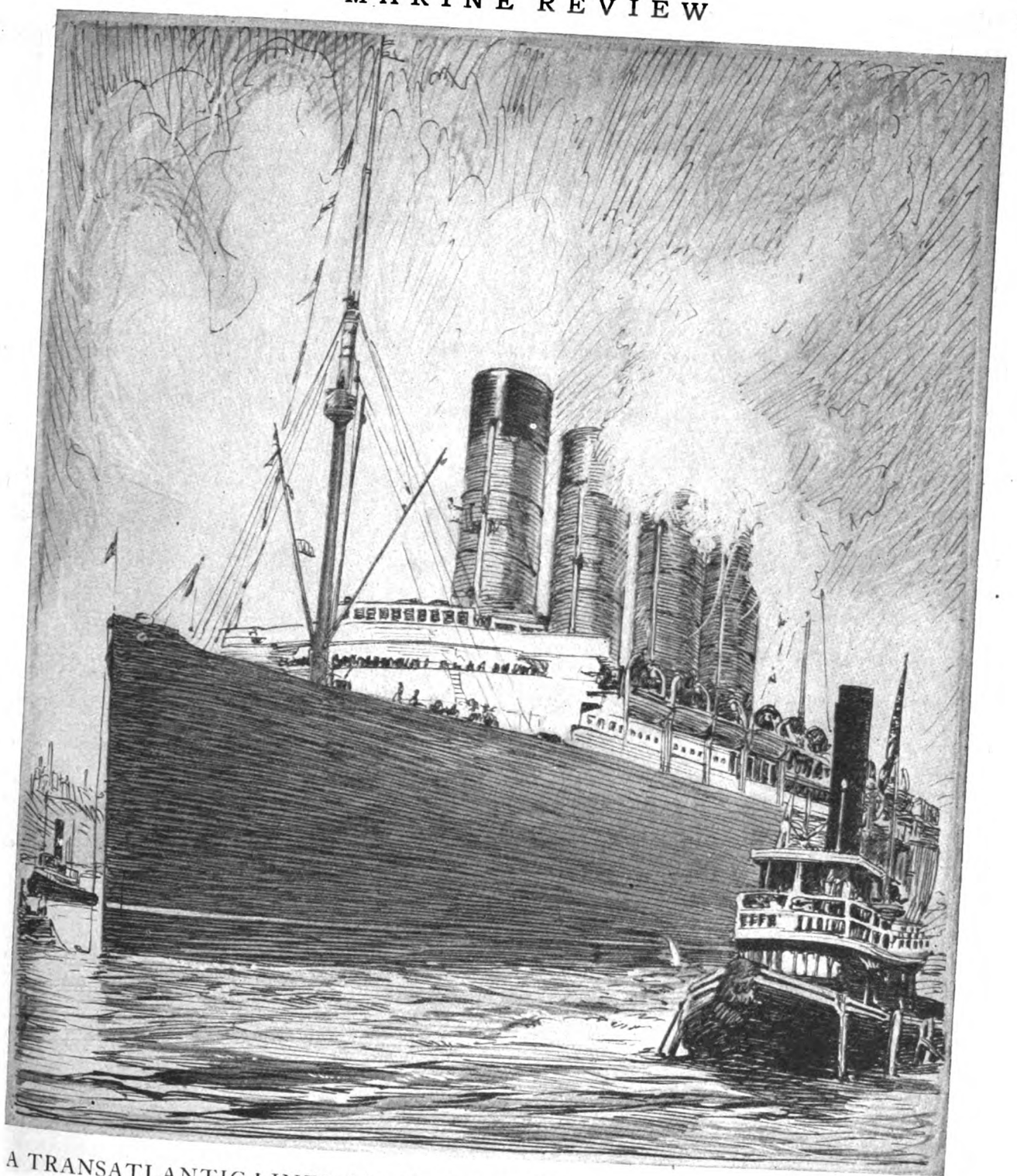

A TRANSATLANTIC LINER LEAVING NEW YORK HARBOUR IN WARTIME

NEW YORK HARBOUR fairly hummed with the industrial and commercial marine activities that preceded our entrance into the War. The peak point of towing and handling service was reached and continued for the three following years.

How well both private industrial groups and the various Governmental Departments were served, in spite of the excess demands made upon the available equipment, is now a matter of history.

The Moran type of Service is still demanded by, and available to, representative industrial groups who desire dependable marine transportation engineering ability and equipment of highest order.

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MORAN TOWING AND TRANSPORTATION COMPANY INC.
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steamers. They purchased several "wreck" steamers and repaired them under the law which permitted a steamer wrecked in American waters and repaired in American yards to the extent of two thirds of its value to receive the American flag and coastwise trading privileges. Later, after this law was repealed, the firm built several steamers at Newport News and Sparrows Point. By 1917 the Bull Line had a fleet of 15 steamers. The A. H. Bull Steamship Co. had been organized in 1902 to operate these vessels.

But interesting things had happened in the meantime. As a part of its schooner business the firm of A. H. Bull & Co. had been hauling sugar from Porto Dico during the season. In 1910 the sugar manufacturers for which it rendered this service had increased their output very largely and wanted quicker transportation. They put up to the Bull firm the ultimatum that if the Bulls did not give steamer service on this sugar business, such service would have to be obtained elsewhere. The agreement that A. H. Bull was not to reenter the Porto Rico trade for a period of 10 years no longer was in effect. The younger members of the firm bestirred themselves and obtained assurances from certain large trading interests that if the Bulls conducted a year-around service to Porto Rico, they could have their support. Accordingly, they entered into contracts which necessitated the regular operation of steamers.

A. H. Bull then was in Florida and the first he knew about his firm's action was after it had occurred. Previously the regular Porto Rico business had been enjoyed by two lines, the New York & Porto Rico Steamship Co. and the Insular Line. There now developed a three-cornered, cut-throat strife in which even the ship captains and crews rallied to their respective standards.

"Father certainly enjoyed this struggle and was determined to carry it on to a conclusion," said Ernest M. Bull to the writer. "At one stage of the proceedings he came down to the office as usual one morning and told us that he had been wondering, coming in on the train, whether we would carry on the fight if anything should happen to him. He told us that unless we guaranteed to carry on, he would revise his will in such a way as to make it obligatory for us. He said that his entire estate, if necessary, should be dissipated in this struggle, excepting a principal sum which would leave my mother an income of $3000 a year. Father did not have to revise his will, because we were as earnest as he was. As a matter of fact, while this struggle was costly, it was a remarkable experience. We were kept constantly on our toes during this period and on the whole we enjoyed the fight."

In 1913 the Bulls secured a controlling interest in the Insular Line. By that time all parties involved had had enough, and the fight petered out by silent consent. Later the Bulls acquired complete ownership of the Insular Line.

Has Seen Steady Growth of the Line

When the Bull firm started in New York in 1899, its office organization comprised seven people. Ernest M. Bull and W. H. R. Killeen attended to the chartering and handled a great many other details. The original partnership was increased to four by the addition of A. L. Burbank as a member of the firm in 1917, but the following year again was reduced to three by the death of Mr. Killeen. In 1925 the firm of A. H. Bull & Co. was incorporated and Ernest M. Bull was elected president. Mr. Bull in 1920 succeeded his father as president of the A. H. Bull Steamship Co., the elder Bull becoming chairman of the board. The following month, February of 1920, A. H. Bull died.

Twenty-five steamers now are comprised in the fleet owned by A. H. Bull & Co. Of these, nine were bought since the war from the shipping board and four were obtained through the acquisition of the Baltimore & Porto Rico Steamship Co. In addition the company charters vessels on a large scale. The company operates four ships regularly in the New York and Porto Rico trade, with regularly weekly sailings in both directions. It requires additional vessels for this trade during the sugar season. It regularly operates three ships in the New York-San Domingo trade and also usually has one or two chartered vessels in this trade. It has one passenger and freight vessel which makes regular weekly trips between San Domingo and San Juan in the Virgin Islands. The firm owns the Baltimore Insular Line which operates four vessels that make weekly sailings from Baltimore to Porto Rico. A weekly service is operated between Baltimore, Tampa and St. Petersburg, Fla. In addition to its headquarters at 40 West street, New York, the company has branch offices at Baltimore and Chicago. In order to handle its business as agent for the shipping board's American-West African Line, the company has three offices on the west coast of Africa, maintained to take care of it efficiently.

Vice President of Steamship Owners

Ernest M. Bull is a vice president of the American Steamship Owners' association. He was a member of the advisory committee which functioned with the shipping board up to the time of the organization of the ship control committee over which P. A. S. Franklin presided.

Mr. Bull's chief interest outside of his business, is in his farm in Orange county, N. Y., where he resides during the summer. During the winter months he lives at Montclair, N. J. Aside from going to Porto Rico for a short stay each winter, Mr. Bull spends his time between his home and his office. He is a member of the Montclair golf club and plays the game irregularly. He is a member of the Union League and Cornell clubs in New York City.

Mr. Bull is deeply impressed with the great opportunities for further progress in the development of the coastwise merchant marine.

"Looking back to 1900," he said, "there has been an enormous increase in coastwise business compared with what then existed. There is no question but what the development over the next 25 years will be just as spectacular. When one considers our far-flung coast-line, and the fact that railroad facilities are taxed in the big cities, the possibilities of future developments in the coastwise trade are clearly seen. Water transportation, in addition to being economical, makes it possible to jump past the centers of congestion, and undoubtedly will have to be used more for that purpose as time goes on and existing land transportaion facilities continue to be further taxed.

"The present conditions in the coastwise trade are satisfactory," said Mr. Bull. "A large proportion of the vessels have been especially designed and built for the services in which they ply and these boats operate as efficiently as might be expected from the ability of Americans in all lines of industry to create the best. The various coastwise companies have splendid facilities in this direction. Furthermore, the business is held in many hands, with resulting keen competition. This competition serves as a challenge to every individual company constantly to study its operating costs, and to further improve its facilities and its service."

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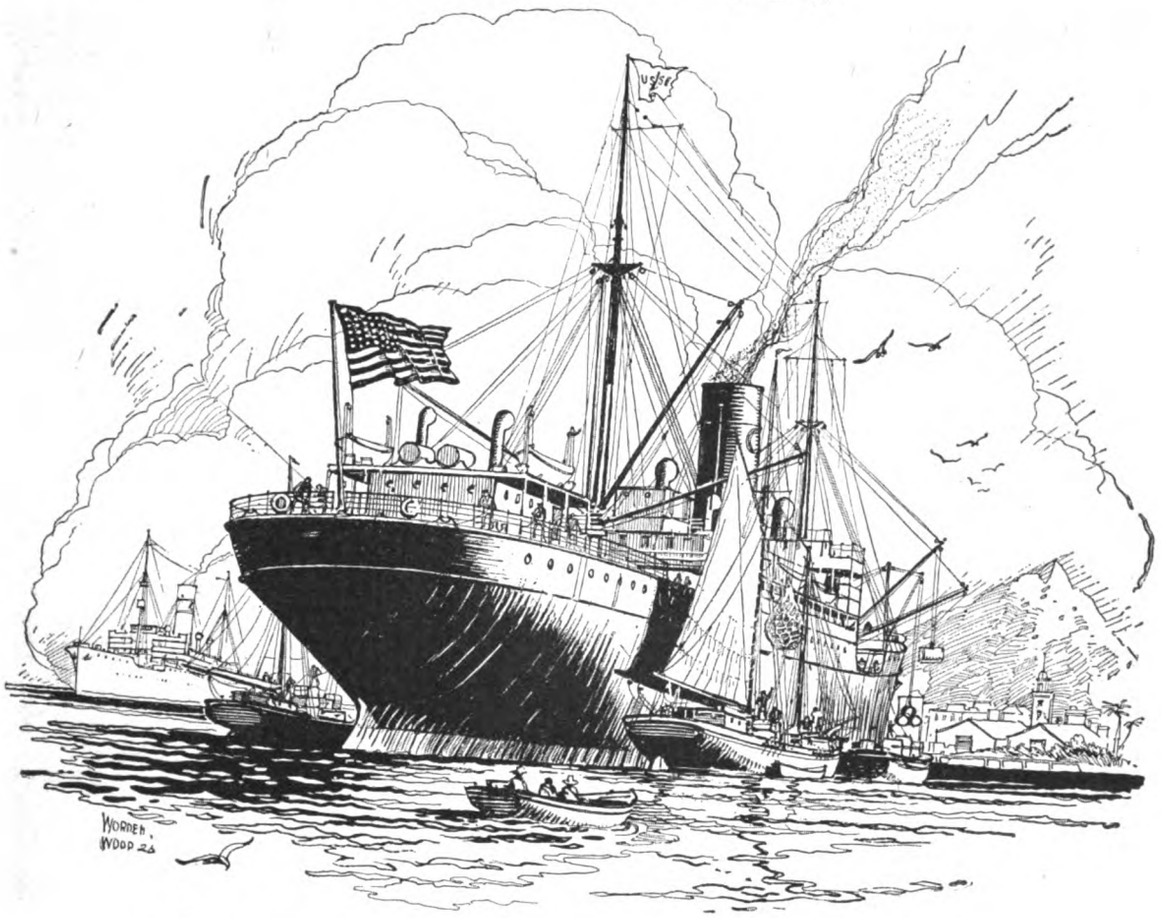

Ship Your Exports via *American* Ships

SPEEDY freight services maintained by cargo vessels operated for the United States Shipping Board and sailing from all the leading American ports to all parts of the world offer a glowing opportunity to the American shipper to broaden and increase his business.

These services deliver shipments promptly and securely, open up new markets for merchandise, give added impetus to foreign trade. Furthermore, they are under the direction of experienced American operators whose advice is bound to prove helpful.

Important units in this fleet are the speedy passenger ships of the United States Lines, sailing from New York to principal European ports. In addition to carrying passengers, the United States Lines ships, led by the famous Leviathan, provide an exceptional express freight service.

For complete information on either freight or passenger service, consult "Schedule of Sailings," a comprehensive publication issued by the Traffic Department, or write direct.

"Americans Ship on American Ships"

TRAFFIC DEPARTMENT

United States Shipping Board Emergency Fleet Corporation

WASHINGTON, D. C.

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Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	466	1,867,630	548	2,171,938
November	454	1,909,756	477	1,885,401
October	486	1,954,853	542	2,301,465
September	492	2,087,694	543	2,270,398
August	491	2,034,147	507	2,075,643
July	493	1,943,133	546	2,251,396
June	542	2,337,678	563	2,279,208
May	448	1,856,777	538	2,126,788
April	483	1,967,964	538	2,248,081
March, 1926.....	523	2,090,347	511	2,033,938

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	145	373,902	129	341,421
November	168	429,403	139	377,016
October	145	370,112	128	329,420
September	107	234,144	82	196,434
August	109	248,435	81	170,661
July	92	191,680	69	128,381
June	104	229,631	56	109,561
May	97	215,829	69	151,287
April	80	185,401	61	135,919
March	107	264,754	72	158,858

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	97	286,013	52	170,314
November	89	275,245	56	177,876
October	109	300,921	58	171,983
September	105	308,189	83	246,136
August	128	321,377	96	206,879
July	152	336,135	108	274,513
June	164	370,526	109	262,468
May	134	277,009	111	261,878
April	101	285,245	77	210,542
March, 1926	117	356,432	62	173,217

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	32	71,748	34	77,400
November	20	34,092	20	34,917
October	20	48,468	23	52,900
September	24	43,783	19	35,828
August	23	47,089	26	45,669
July	27	47,885	26	47,569
June	29	44,390	29	46,942
May	19	49,894	17	47,016
April, 1926	23	48,836	32	73,947

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
November, 1926....	2	7,689	2	7,690
October	7	23,091	8	29,815
September	5	20,651	5	22,324
August	6	20,764	3	12,299
July	7	29,207	5	18,641
June	5	17,954	3	8,355
May	7	25,057	6	20,806
April	8	28,449	5	23,480
March	15	47,557	8	34,025
February, 1926....	8	29,622	7	30,033

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	34	131,426	56	213,861
November	34	135,455	48	173,820
October	41	151,013	59	217,745
September	33	126,772	56	201,152
August	40	150,609	46	167,419
July	24	93,977	33	127,270
June	22	77,850	45	156,103
May	35	128,351	43	152,890
April	17	66,789	29	107,892
March, 1926	21	85,073	38	134,432

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926 ..	245	722,141	269	783,058
November	292	818,707	298	853,723
October	271	791,999	261	783,263
September	230	678,127	224	670,465
August	228	672,453	221	639,677
July	211	644,261	202	603,648
June	138	402,230	132	371,781
May	120	369,729	121	355,443
April	107	330,401	110	326,649
March, 1926.....	120	382,983	119	362,256

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	216	636,483	254	781,545
November	184	527,290	281	782,914
October	252	683,297	307	850,828
September	252	705,604	281	766,503
August	188	545,861	255	733,837
July	267	727,374	309	854,305
June	78	215,803	171	502,701
May, ...	40	107,858	140	368,515
April	21	45,875	126	305,549
March, 1926	22	40,160	140	395,033

Savannah

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
March, 1926	43	102,126	41	99,244
February	40	97,908	46	121,792
January	38	103,029	38	106,472
December	37	101,726	35	91,141
November	37	112,158	38	117,064
October	45	125,766	47	126,452
September	50	137,030	39	103,408
August	34	77,027	39	87,455
July	38	97,332	34	91,981
June, 1925	26	60,788	27	60,924

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	92	113,985	87	104,448
November	97	116,965	97	115,032
October	78	92,987	79	96,718
September	81	91,321	80	88,844
August	84	98,702	87	99,362
July	78	86,124	77	86,323
June	94	110,100	94	108,581
May	114	126,089	109	120,597
April	88	101,881	88	99,227
March, 1926	102	117,292	90	114,917

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	82	164,129	82	174,618
November	90	200,301	83	182,839
October	98	213,430	99	211,785
September	84	179,225	75	165,838
August	89	166,164	81	158,197
July	86	153,642	84	159,256
June	89	168,610	89	163,318
May	99	183,795	95	191,442
April	109	205,035	98	178,025
March, 1926	125	228,481	115	221,022

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	42	176,065	54	201,988
November	63	234,742	54	231,343
October	56	236,587	55	230,412
September	54	219,623	58	233,320
August	53	229,111	48	206,042
July	35	146,670	31	126,407
June	39	165,989	42	181,090
May	39	159,755	44	163,718
April	51	215,641	47	191,161
March, 1926	38	166,536	45	184,067

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926....	259	745,636	266	755,204
November	253	731,871	238	685,253
October	236	673,606	250	721,608
September	226	620,095	240	666,778
August	275	764,464	256	721,654
July	263	716,066	270	739,005
June	255	658,385	221	665,960
May	287	753,621	284	772,138
April	248	626,277	296	694,678
March, 1926	295	754,863	300	751,054

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net. tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	33	94,427	39	102,724
November	39	114,449	39	103,266
October	11	32,323	15	40,127
September	22	65,872	34	98,447
August	24	64,334	20	51,505
July	13	37,020	13	33,908
June	8	27,095	10	30,601
May	5	18,321	10	20,514
April	11	37,459	12	27,166
March	18	64,432	20	49,897

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
November, 1926....	64	180,917	118	359,948
October	47	112,816	118	352,208
September	52	139,219	127	368,302
August	55	129,477	131	389,432
July	60	164,241	116	352,290
June	53	119,497	72	185,444
May	28	65,578	61	180,449
April	37	87,356	82	216,312
March	42	87,056	72	208,346
February, 1926....	39	89,426	71	208,388

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926..	155	438,464	123	386,004
November	184	439,736	138	337,937
October	187	448,038	155	421,807
September	151	406,314	211	386,739
August	143	458,240	151	399,349
July	127	460,296	103	352,367
June	123	349,936	88	344,187
May	133	376,720	112	351,123
April	149	434,866	130	370,158
March	139	371,793	128	305,105
February, 1926....	119	363,875	111	306,161

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1926....		520,962		500,347
November	128	543,103	139	512,671
October	145	532,024	153	575,263
September	170	568,323	156	561,513
August	169	580,310	111	466,346
July	160	523,527	102	495,849
June	142	561,774	100	419,036
May	154	605,068	116	428,814
April	155	583,821	167	602,680
March, 1926	144	571,040	135	511,010

Port Arthur

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
November, 1926..	25	67,293	31	96,171
October	19	53,558	23	71,270
September	15	43,874	22	72,960
August	19	63,639	24	71,545
July	25	79,464	32	98,637
June	22	70,743	30	97,056
May	20	60,276	36	95,754
April	32	95,592	38	108,923
March	28	87,715	37	101,830
February, 1926....	21	65,930	32	70,814

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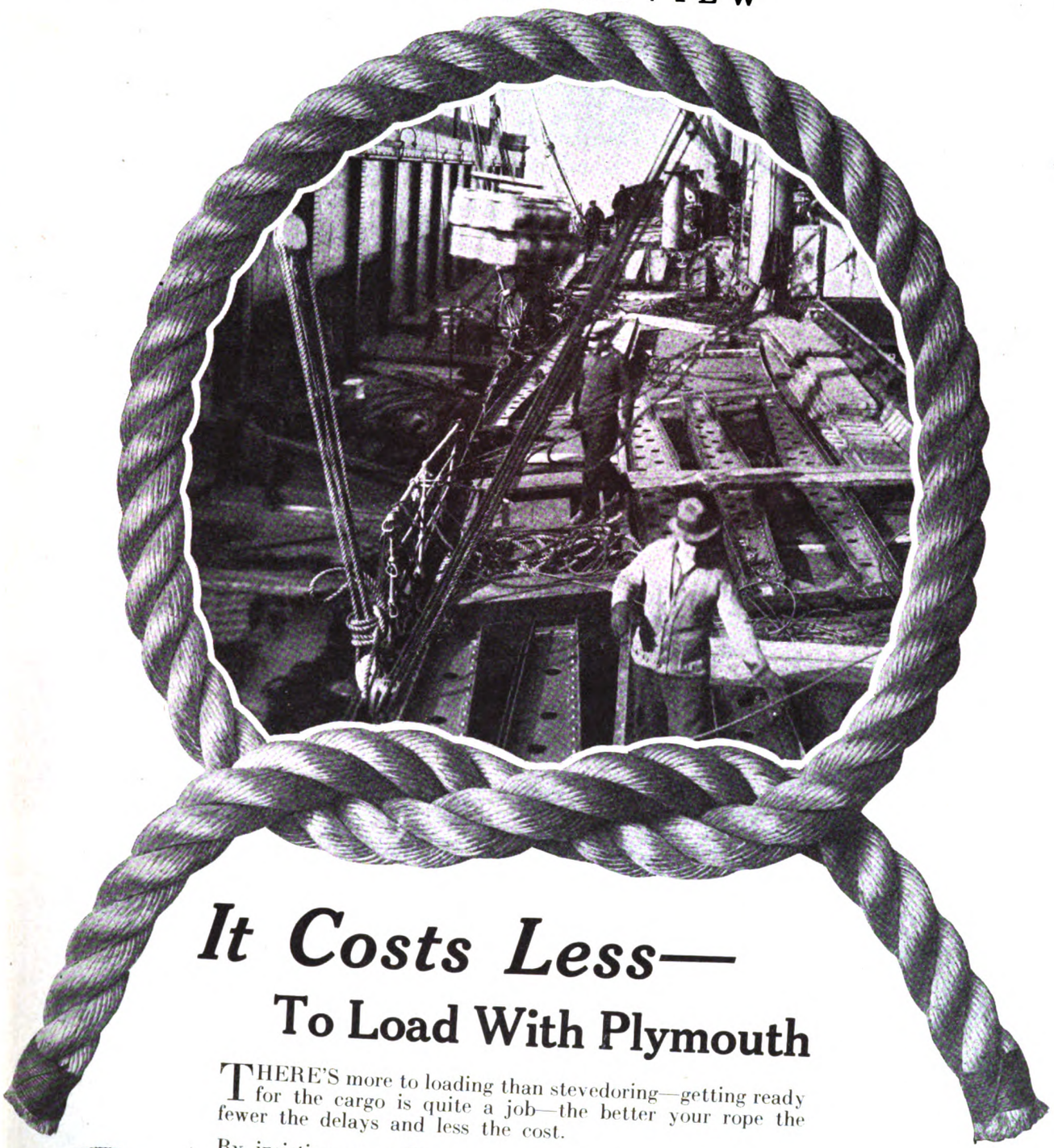

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To Load With Plymouth

THERE'S more to loading than stevedoring—getting ready for the cargo is quite a job—the better your rope the fewer the delays and less the cost.

By insisting upon Plymouth Cordage for all your loading tackle, you insure against last minute replacements and failures during loading operations.

If you have never used Plymouth—ask the man who knows—he will tell you that it is stronger and more flexible than ordinary rope—that it better resists abrasive wear and can always be trusted in any class of service.

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What the British Are Doing

Short Surveys of Important Activities in Maritime Centers of Island Empire

THE Southern railway's £13,000,000 scheme for the extension of docks at Southampton has been started. Under the scheme 407 acres of mud will be reclaimed from the river in order to provide accommodation for 20 of the world's largest liners.

* * *

SHIPBUILDING is sharing in the anticipated trade revival of 1927, and among the orders secured is one by Smith's Dock Co. of South Bank, Tees Side for the building of three steamers for the Canadian lakes, and also for a cargo steamer of about 4000 tons. The first ship to leave the stocks in British yards this year was the ARANDORA, the fifth and last of the new £4,000,000 Blue Star fleet built by Cammell Laird & Co. Carrying only 180 passengers, all first class, this boat will help to maintain a fast fortnightly service between London and the South American ports. A feature of the service will be that for a fare lower than that of the first class fare on British railways; passengers will cross the Atlantic in the enjoyment of accommodation surpassing that of the most luxurious hotels in the world.

* * *

THE Cunard liner AQUITANIA has been completely overhauled in dry dock for two months and left Southampton on Jan. 5 on her one hundred and fourteenth voyage across the Atlantic. On the furnishing department alone 3000 men have been at work and the reconditioning included the examination of 200 miles of cable and 700 miles of electric wiring, while 90,000 porcelain insulators, 10,000 lights and 1500 bell pushes had to be attended to. The vessel accommodates 3000 to 4000 persons and has her own hospitals, recreation ground, police and shops.

* * *

LORD GLANELY insists that all British materials shall be used in the construction of five new steamers to be added to his Cardiff fleet. Four of the ships are to be built at Sunderland and one at West Hartlepool. Robert Thompson & Sons Ltd., Sunderland will build two of 9850 tons each and one of 7000 tons; William Pickersgill & Sons Ltd., Sunderland, one of 9400 tons, and W. Gray & Co. Ltd., West Hartlepool, one of 8800 tons.

* * *

ONE of the two new British battleships, H. M. S. RODNEY, authorized under the Washington treaty is nearing completion in the yards of Cammell Laird & Co. Ltd., at Birkenhead. She is expected to be ready by next summer and will be the most powerful battleship in the world. The same firm has under construction vessels for Elders & Fyffes Ltd., the Blue Star line, Alfred Holt & Co., the Isle of Man Steam Packet Co., and the Lancashire Shipping Co.

* * *

BRITISH shipbuilders have never experienced such a bad year as 1926, many yards having been closed entirely. The coal strike effectively checked essential supplies of material and resulted in the closing of other shipyards which had a certain amount of work in hand. On the Tees only 11 ships of a gross tonnage of 40,599 were built during 1926, compared with 35 vessels with a tonnage of 111,081 in 1925.

What's Doing Around The Lakes

STEAMSHIP companies report bulk and freight package shipping somewhat heavier in volume than in the early winter months last year. This increase is estimated on the whole as about 10 per cent. The weather has been advantageous for winter shipping and thus far has resulted in comparatively few delays in schedule. Adverse weather during the winter months of the current season has been in the nature chiefly of high winds, with some slush ice in several of the harbors. Passenger and freight boats now are all on winter schedule. Daily service from Chicago to Milwaukee is being maintained by the Goodrich Transit Co., while services to Muskegon and Grand Haven and also from Chicago to Benton Harbor and Holland, Mich., are on the basis of three trips weekly.

* * *

AT THE yards of the Manitowoc Shipbuilding Corp., Manitowoc, Wis., the new steel carferry just completed for the Grand Trunk railroad, was launched and christened Jan. 19. Miss Marian Dixon, daughter of George W. Dixon, one of the directors of the Grand Trunk system, christened the ferry, using a bottle of milk, symbolic of the dairy industry in Wisconsin, the leading industry of the state.

* * *

ARTHUR H. VOGEL, manager of the Milwaukee division of the Great Lakes Dredge & Dock Co., has resigned and is succeeded by Henry J. Niederman, formerly assistant manager. Mr. Vogel assumed the direction of the local division when the Great Lakes company took over the C. H. Starke Dredge Co., Milwaukee, in 1914, he then being president of the Starke company, with Mr. Niederman as assistant. B. D. Schnable, formerly assistant engineer at Chicago, will be assistant manager at Milwaukee, and Richard Beauvais, formerly superintendent of marine work, is promoted to division superintendent.

* * *

THE Chicago river is regarded as of little importance as a navigable stream, and much pressure is being used for the final elimination of the bascule bridges, blamed for much of

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Dependable service and easy upkeep

This battery is built so rugged that it keeps going strong with a minimum of attention

MORE and more users are learning that electric industrial trucks equipped with Exide-Ironclad Batteries are the most efficient means of handling material.

There is just one reason for this—the dependability of the Exide-Ironclad Battery. This battery is built rugged to stand the wear and tear of hard usage. Except for recharging and flushing, it will stay on the job for years with practically no attention.

The secret of Exide-Ironclad dependability lies in the construction. The cell jars and covers are made of Giant Compound, a practically unbreakable material. The cell connectors are flexible straps of lead-plated copper, and will not crystallize under vibration.

Both positive and negative plates are built extra-strong and are equipped with feet that rest on ribs at the bottom of the cell. In addition, the positive plate is of a special tubular construction that keeps the active material in place and retards its loss—thus giving the battery longer life and greater durability.

These are some of the features that make this battery a most profitable investment. But it has many other advantages which you ought to know about. Send for our booklet, "Facts for consideration in selecting a Storage Battery," Form No. 2865. It will give you full details.

Read this!

"We are using your Ironclad batteries exclusively in our industrial trucks, and have obtained excellent results and very satisfactory service from their use. This fact is all the more pertinent in that our trucks are subject to very severe and trying conditions.

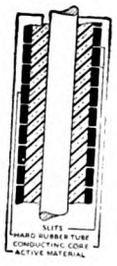
"We are glad of this opportunity of telling of the performance of your batteries, and of commenting in addition on the prompt and courteous response of your employees.

"India Wharf Storehouses"
Brooklyn

The Exide-Ironclad positive plate consists of a metal grid from which extend conducting rods, each surrounded by active material and cased in a slotted rubber tube.

Exide
IRONCLAD BATTERIES

Cross-section showing how rubber tube retains in place and retards the loss of the active material of the plate. The slits give the electrolyte free access to the active material.



THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

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the traffic congestion in the business district of the city. Nevertheless, the voters have authorized a bond issue for the building of an additional bridge to connect the Grant Park outer drive south of the Chicago river with the outer drive running north of the river. The bridge will complete a speedy route past but not through the congested center of the city, and will enable motorists to go from one end of the city to the other without encountering cross traffic. The war department engineer, however, has decided not to go ahead with the work at this time, pending the report of the Putnam commission on the proposed development of the Chicago harbor. The proposed bridge would cross the river at the harbor mouth.

* * *

PIONEERING work as a ship-to-truck carrier of freight has been undertaken by the Goodrich Transit Co. in establishing its new fleet of motor truck freight carriers from Holland to Grand Rapids, Mich., thus assuring through freight service from Chicago and Grand Rapids. The water-truck freight service is being started as a result of the abandonment of the Grand Rapids, Holland & Chicago electric line, which handled freight shipments from Holland, Mich., to Grand Rapids in transit from Chicago and other Lake Michigan points. The company was enabled to establish the motor truck fleet without raising freight rates, and the freight shipping experiment is operating satisfactorily. Truck service for passenger transportation from Holland to Grand Rapids may be put to service later, but it is doubtful whether the Goodrich company will operate a passenger service at this time. The Goodrich company also is operating a limited truck service between Sheboygan and Manitowoc.

Ocean Freight Rates

Per 100 Pounds Unless Otherwise Stated

Quotations Corrected to Jan. 19, 1927 on Future Loadings

NOTE: FREIGHT RATES STEADY BUT WITH DECREASE TO SOME PORTS

New York to	Grain	Provisions	Cotton (H. D.)	Flour	General cargo cu. ft.	General cargo 100 lbs.	††Finished steel	REMARKS Freight Offered
Liverpool	2s 6d	$0.60	$0.60	0.35	$0.50	$0.90	$8.00T***	Good
London	2s 6d‡	0.60	....	0.25	0.50	0.90	8 00T***	Fairly good
Oslo	$0.25	0.50	0.50	0 35	0.50	1.00	8 00T	Fair
Copenhagen	0.25	0.50	0.50	0.35	0.50	1.00	8.00T	Fair
Hamburg	0 19	0.55	0.50	0 25	0.50	0.90	10 00T	Good
Bremen	0.22	0.45	0.50	0.28	0.50	0.90	10.00T	Good
Rotterdam and Amsterdam	0.18	0.32½	0 60	0.25	0.45	0.80	9.50T	Fair
Antwerp	0.18	0.32½	0.45	0.25	0.45	0.80	9.50T	Fair
Havre	0.20	0.55	0.50	0.35	0.45	0.80	8.00T	Fair
Bordeaux	0.20	0.55	0.50	0.35	0.45	0.80	8.00T	Fair
Barcelona	....	12.00T	0.60	10.00	—12.00T—		10.00 to 15.00T	Fair
Lisbon	....	0.75	0.50	8.00T	—23.00T—		8 00T	Fair
Marseilles	....	0.65	0.40	7.00	—23.00T—		6.00T	Fair
Genoa	0.20	14.25	0.50	9.00	—23 00T—		11 50T	Fair
Naples	0.20	14.25	0.50	9.00	—23.00T—		11 50T	Fair
Constantinople	0.35	20.00T	0.85	0 48	—24 00T—		10.50T	Fair
Alexandria	....	20.00T	0.85	0 48	—24.00T—		10 50T	Fair
Algiers	....	0.85	0.60	0.45	—23.00T—		11 50T	Fair
Dakar	....	17.00	....	15 50T	—23 00T—		11 50T	Fair
Capetown	....	18.00	....	13.00	20.00		13 00	Good
Buenos Aires	....	22.00T	....	....	—22.00T†		8.80T	Fair
**Rio de Janeiro	....	22.00T	....	8.00T	20.00 to 22.00T†		7.00 to 7.70T†	Fair
Pernambuco	....	22.00T	....	9.00T	—22.00T—†		9.70T†	Fair
Havana	0.22½*	0.50	....	0.30*	....	....	4.00	Fair
Vera Cruz	....	0.30	0.35	0.25	0.52½	1.05	0.30 to 0.35	Fair
Valparaiso	....	1.07	....	0.70	0.45	0.80	10.00T	Fair
San Francisco	....	0.35 to 0.70	....	0.50 to 1.10	....	....	0.25 to 0 80	Good
Sydney	....	18.00T	1.25	18.00T	18.00-24.00T		9.00-12.00T	Fair
Calcutta	....	....	0.75	10.00T	—16.00T—		10.00T	Fair

T—Ton. ‡Per quarter of 480 lbs. †Landed. ††Heavy products limited in length. *Extra charge for wharfage. **Plus $0.50 surcharge on all rates to Rio de Janeiro on account of congestion. ***Plus 15 per cent.

From North Pacific Ports to	Lumber Per m. t.
San Francisco	$4.50 to 5.00
South California	4.50 to 5.00
Hawaiian Islands	9.00 to 10.00
New Zealand	16.00 to 19.00
Sydney	13.50 to 14.00
Melbourne-Adelaide	13.50 to 14.50
Oriental Ports	8.50 to 9.50
Oriental Ports (logs)	12.00 to 14.00
Peru-Chile	13.00 to 14.50
South Africa	18.00 to 20.00
Cuba	15.00 to 17.00
United Kingdom	85s to 110s
United Kingdom (ties)	....
Baltimore-Boston range	$14.00
Florida Range	No rates
Buenos Aires	15.00 to 17.00

Flour and Wheat

U. K. and Continent (gross ton)	37s 6d to 40s 0d
Oriental Ports (net tons)	$4.25 to 4.75

NOTE: Lighterage rates on fuel in New York reduced from 6½ to 5½c per barrel. The coal strike in Britain is now settled and freight rates or bunker prices for coal or pig iron are again quoted.

General cargo rates to Havana change daily and are omitted for the time being.

Rates to Calcutta are subject to change without notice. Cotton goes only to Bombay.

Principal Rates To and From United Kingdom

	s	d		s	d
Grain, River Plate to United Kingdom	30	0	Pig iron, United Kingdom to New York or Philadelphia	—	—
Coal, South Wales to Near East	12	0	Iron ore, Bilbao to Cardiff	6	9
Coal, United Kingdom to Buenos Aires	14	6	Iron ore, Huelva to Phila. or Balto.	11	6
Manganese Ore, Poti to Philadelphia	$5.75				

Bunker Prices

At New York

	Coal alongside per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
Mar. 18, 1926	5.60@5.80	1.80½	5.50c
Apr. 22	5.25@5.60	1.80@1.81½	5.75
May 19	5.25@5.60	1.80½	5.88
June 18	5.50@5.60	1.80½	6.08
July 20	5.00@5.60	1.80½	6.08
Aug. 12	5.00@5.60	1.81½	6.10
Sept. 18	5.45@6.00	1.81½	6.05
Oct. 22	7.25@7.50	1.70½	5.86
Nov. 19	7.00@7.50	1.81½	5.87
Dec. 20	6.25@6.50	1.81	5.86
Jan. 19, 1927	5.90@6.15	1.81½	5.87

At Philadelphia

	Coal trim. in bunk per ton	Fuel oil alongside per barrel	Diesel Eng. oil alongside per gallon
Mar. 18, 1926	5.00@5.25	1.80@1.86½	5.40@5.65c
Apr. 22	5.25	1.77@1.86½	5.90@5.93
May 19	5.25@5.70	1.82@1.86½	6.15@6.38
June 18	4.90@5.15	1.80@1.86½	6.15@6.43
July 20	5.10@5.50	1.74@1.81½	5.97@6.15
Aug. 12	5.00@5.25	1.69@1.74½	5.75@6.17
Sept. 18	5.00@5.35	1.74@1.74½	6.14½
Oct. 22	7.25@7.50	1.74@1.80½	5.66@5.88
Nov. 19	7.00@7.50	1.80½@1.81	5.43@5.88
Dec. 20	5.50@5.75	1.80@1.90½	5.64@6.19
Jan. 19, 1927	6.20	1.95@1.95½	5.88@6.19

Other Ports

Boston, coal, per ton	$10.49
Boston, oil, f. a. s., per barrel	$1.81
Hampton Roads, coal, per ton, f.o.b., piers	$5.25
Jan. 11 — Cardiff, coal, per ton	17s 6d
London, coal, per ton	—s —d
Antwerp, coal, per ton	26s 0d
Antwerp, Fuel oil, per ton	77s6d
Antwerp, Diesel oil, per ton	97s 6d
British ports, Fuel oil	85s 0d
British ports, Diesel oil	100s 0d

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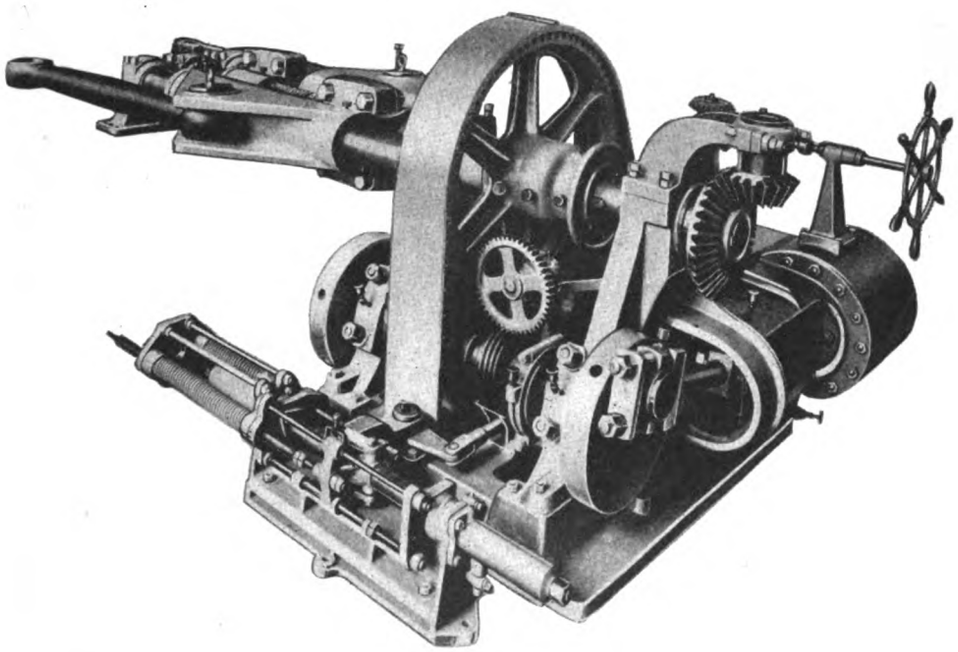

The screw gear steerer illustrated above is a thoroughly tested machine which has stood up under the most severe service in a large number of installations.

It is only one of the many machines in the complete A-E-CO line, which includes steam, electric and electro-hydraulic deck auxiliaries of a wide variety of types.

Winches — Windlasses — Gypsies

Cargo Hoists — Steerers — Telemotors

American Engineering Company

Aramingo and Cumberland Sts.

Philadelphia, Pa.

"Leaders in the Marine Field Since 1857"

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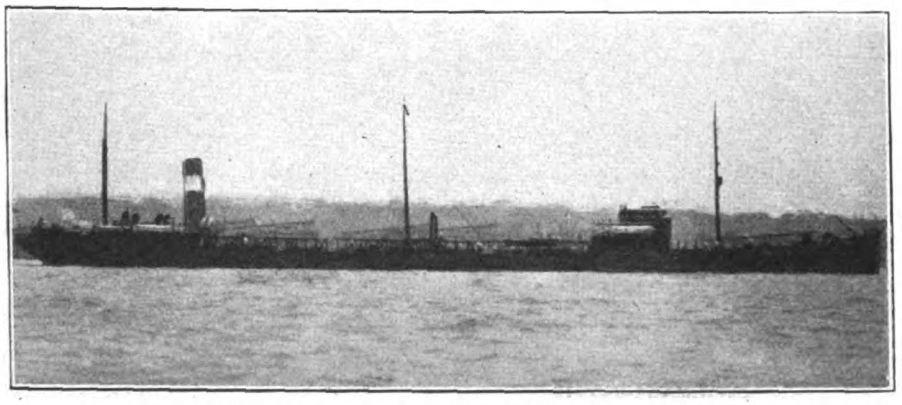
Fit Diesels in Tanker



Tanker E. T. BEDFORD recently converted from steam to diesel drive

TWO 2-cycle Busch-Sulzer diesel engines capable of driving the ship at a sea speed of 11 knots have been installed in the E. T. BEDFORD, first of the Standard Oil Co. (N. J.) fleet to be converted in America from steam to diesel drive. The vessel, which sailed recently on her maiden voyage as a motorship, was formerly equipped with triple expansion steam engines capable of developing 3500 indicated horsepower. The new diesel machinery which was installed by the Federal Shipbuilding & Drydock Co. consists of two propelling units, each of which has the following characteristics:

Power— 1500 shaft horsepower at 90 revolutions per minute.
Type 2-cycle, single acting.
Number of cylinders—Four.
Bore and stroke—30" x 42".
Total fuel consumption per day—6.9 tons.
Total lubricating oil consumption per day—13 gals.

The auxiliary diesel units of the E. T. BEDFORD consist of three 150 shaft horsepower engines, one of which will operate a 100-kilowatt generator, the other two of which will each operate a 50-kilowatt generator and an auxiliary air compressor. All engine room machinery including steering gear is electrically operated, the only steam pumps installed in the machinery space being provided for emergency use. Previous to her conversion the E. T. BEDFORD was equipped with two 14 x 20 x 16½ x 24 inches steam driven horizontal duplex cargo pumps. These pumps have not been changed but steam is now supplied to them by two Babcock & Wilcox boilers each having approximately 1600 square feet of heating surface and designed to supply steam at 100 degrees superheat under a working pressure of 250 pounds per square inch.

Donkey boilers are not used aboard the new motorship except for discharging cargo and ballast. Instead a small heating boiler has been provided for heating the fuel oil, quarters and machinery space; this is installed in a gas-tight compartment in the lower engine room where it is easily accessible to the engineers and oilers who look after the operation of this equipment. Nor is this space the only one which has been made gas tight; special compartments have also been provided for fuel oil tanks, lubricating tanks, donkey boiler, etc., where the collection of gases might prove a source of danger, and more than ordinary care has been given to the design of the engine room ventilating system throughout.

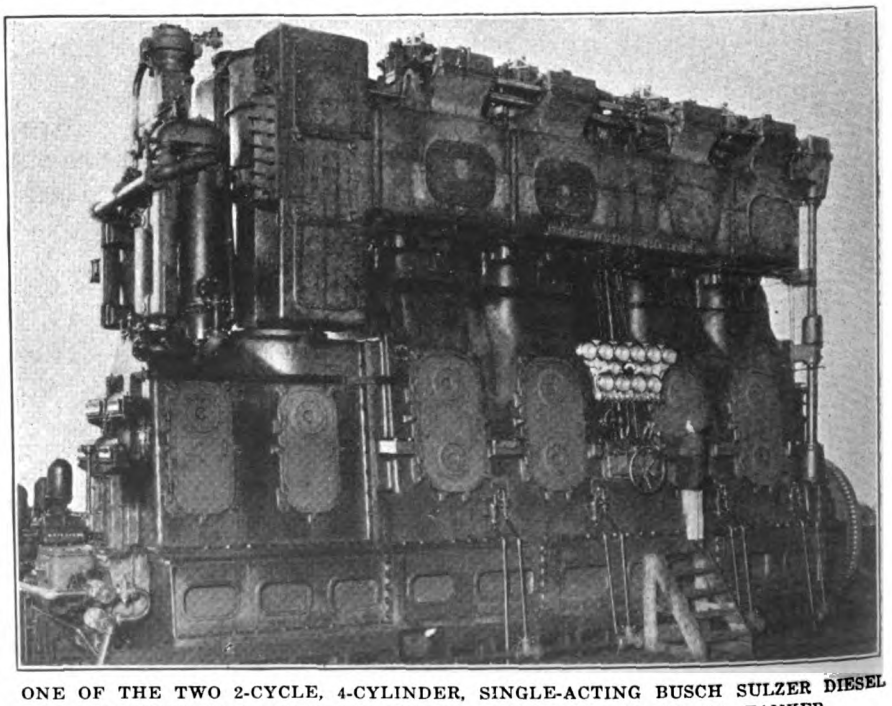
The fuel oil system consists of two day-tanks each having a capacity equivalent to 15 hours' consumption, equipped with heater coils and so shaped that any water and sediment in the fuel will drain to a low point from which it can be readily withdrawn. While the motors are being operated from one tank fuel will be drawn from the bunkers and passed through a centrifuge into the second tank from which it will be fed to the motors while the first tank is being cleaned and filled with fresh oil.

In recognition of the important part which clean lubricating oil bears to the successful operation of diesel engine equipment careful consideration was given to the design of the lubricating system on the E. T. BEDFORD. As a result, although the piping arrangement is very simple, purification of the entire amount of lubricating oil in circulation is effected once every 24 hours.

Particular care has been exercised to reduce the hazard of fire. The tanker has been equipped throughout with what is known as the Lux fire system furnished by Walter Kidde & Co. No less than 118 carbon dioxide cylinders are installed on the upper deck in banks of ten, eleven and twelve, depending on the spaces to be protected. Control of the system to extinguish fire in any part of the ship is embodied in a set of pull handles located in the aft passageway on the bridge deck.

Each control handle releases a

(*Continued on Page* 48)



ONE OF THE TWO 2-CYCLE, 4-CYLINDER, SINGLE-ACTING BUSCH SULZER DIESEL ENGINES INSTALLED IN THE STANDARD OIL CO. (N. J.) TANKER E. T. BEDFORD—EACH ENGINE DEVELOPS 1500 SHAFT HORSEPOWER AT 90 REVOLUTIONS PER MINUTE

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and now

An Electrical Marine "Shifter"

for moving barges speedily

THE new double-ended Diesel-electric drill tugs, placed in service by the Pennsylvania Railroad Company, move barges from one berth to another or from one dock to the next in a fraction of the time required by other means.

Turn around is unnecessary because both ends of this towboat are exactly alike. Each end has a rudder that can be manipulated independently, or simultaneously with, the rudder at the other end. This gives enormous flanking power and ability to move a loaded barge directly out from the dock with minimum maneuvering.

The control of the propelling motor which actuates the propellers, one at each end, is designed to permit 30 speeds in either direction, can be reversed almost instantly. Complete control of propelling and steering is centered in the pilot house.

The Diesel engines which operate at constant speed, and in one direction at all times, require no maneuvering. Application and control of power through Westinghouse generators, motors and control apparatus assure high efficiency, flexibility and reliability.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in Principal American Cities
Service Stations in Principal American Ports

Westinghouse

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Wanted—Private Operator

(*Continued from Page* 12)

president of the Emergency fleet will not in our opinion accomplish the aim set forth above. The shipping board is faced with great responsibility and its members will be held accountable for decisions made. It is perfectly natural therefore that the board should wish to be convinced beyond a doubt of the financial responsibility and qualifications as an operator of a bidder before selling or chartering the lines.

Claims Offers Were Too Low

There is nothing however in the testimony of the chairman of the shipping board before the senate committee to indicate that he is doubtful of either the financial responsibility or operating ability of those who presented bids for the government lines. One of the bidders in fact has his confidence so completely that he is now operating for the board one of the lines involved in the proposed sale. His reasons for the board's proposed rejection of all offers for the two lines as outlined in his testimony were: first, that no bidder offered a fair price; second, that he was in favor of selling the vessels to a purchaser with the right kind of a directorate, meaning large commercial interests, who would give these vessels the transportation of their own freight.

As to the first of these reasons, what is a fair price under stipulated conditions in a limited market? The chairman thinks $15,000,000 and not less than $10,000,000, the cost of reconditioning the LEVIATHAN. There is, we believe, a law to the effect that the latter ship must not be sold for less than the cost of reconditioning. He does not apparently consider part purchase and part charter as provided in two of the proposals. Also his definite statement that if the American merchant marine is to be privately operated, a subsidy of some nature is imperative does not seem consistent with his desire for an arbitrary purchase figure higher than any of the bids received from responsible and experienced operators. No one would, of course, find fault with the board for getting as high a figure as would be consonant with possible success under efficient operation. In other words the board can in this specific instance provide the aid, to some extent at least, which it claims the operator needs, by keeping the initial cost low. There is also something of good faith involved in rejecting bids which comply with the conditions stipulated. Can the board keep on indefinitely asking for bids and rejecting them? Wouldn't it have been much fairer all around to have published a minimum figure and then asked for bids above this figure making all prospective bidders qualify as to responsibility and fitness before acceptance of their bid? As it stands the whole proposition is farcical and appears as an insincere public gesture.

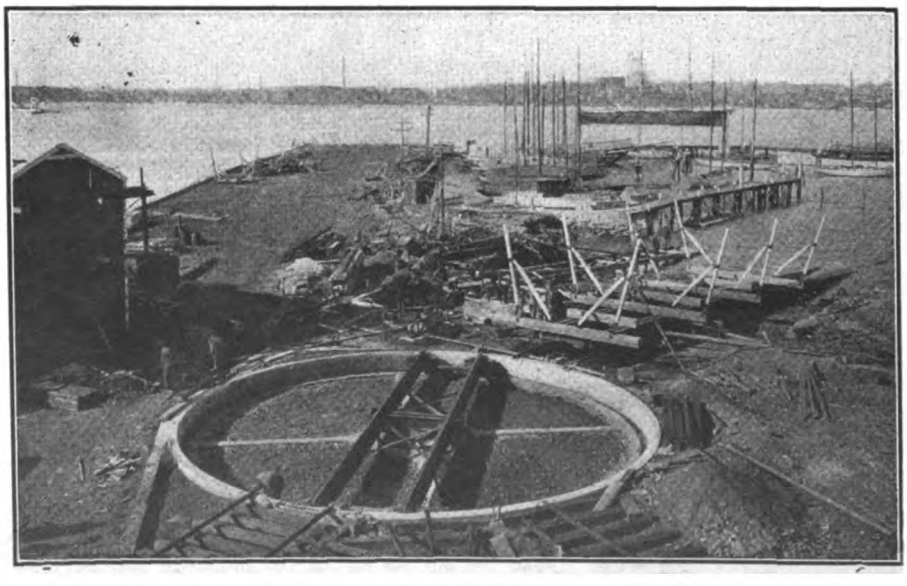
Wants an Influential Directorate

Mr. O'Connor's second implied reason for rejection of the bids, that there was lacking a directorate of powerful commercial interests who would place all the freight that they controlled on American ships, stirs the imagination. Who would not want such positive assurance of business in hand at the very start of a new venture? But isn't the board selling or chartering a going line with considerable percentage of space filled even under present conditions? Isn't much of this freight and many of these passengers of American origin and is there any reason to think that the large commercial interests will be less favorable to a privately operated line? We are of the opinion that the proper kind of private operator will be able to increase this business and that it will not be difficult if necessary to enlist outstanding captains of industry to serve on the board of directors.

Ships Must Be Replaced

Chairman O'Connor aptly said that trying to maintain a merchant marine without replacements makes us the capital joke of the world, also that it is just as important to have shipyards as it is to have ships in the merchant marine. He should, therefore, be particularly impressed with the Winchester-Gibbs proposal which included the offer of at least $10,000,000 of private capital toward the building of two new passenger liners to supplement the LEVIATHAN to provide what is sadly needed, a proper high-class balanced service. The building of two such ships in American shipyards would be of inestimable value to the art of merchant shipbuilding in the United States and would encourage other shipbuilding projects.

Let us by all means try to solve this extremely serious and important problem, with good will, without rancor, enlisting the wisest counsel, and with unselfish earnestness for the best interests of our common welfare as a nation.



THIS interesting and very practical yacht railway and turntable was recently installed at the yard of Peirce & Kilburn, Fairhaven, Mass. It is of 75-ton capacity and was designed and constructed by the Crandall Engineering Co., drydock engineers, Boston.

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Bethlehem Oil Engines

Diesel Two-Cycle Type

For Driving Small Vessels

THE Bethlehem Small-Unit Oil Engine is designed to meet the power requirements of marine service for the propulsion of tugs, ferries, yachts, fishing boats, lighters, self-propelled barges, dredges and other small craft. It is built in units of three, four and six cylinders in sizes ranging from 90 S.H.P. at 400 Rpm., to 570 S.H.P. at 250 Rpm.

Simplicity and Economy: The engine is remarkably simple in construction and operation.

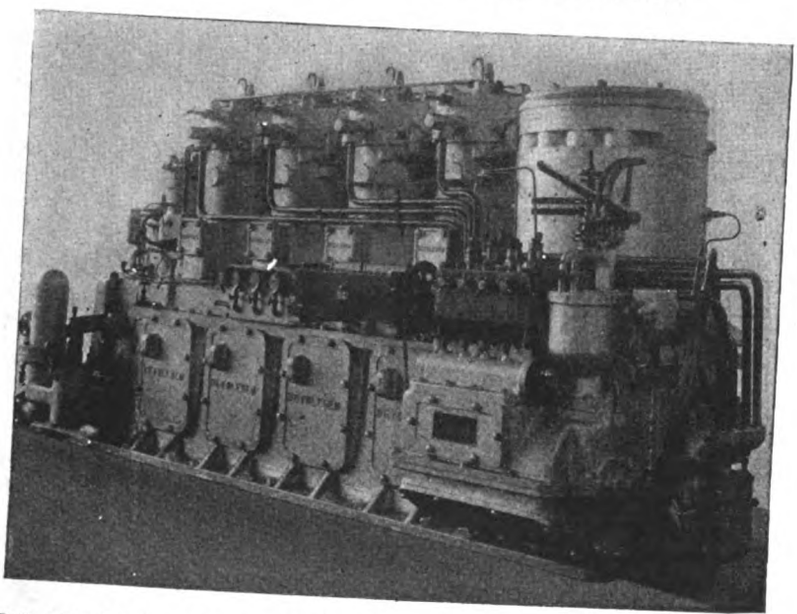
A wide range of fuel oils can readily be burned and the fuel consumption is low.

The Bethlehem Oil Engine burns only one-third the amount of fuel necessary to operate a steam engine of the same power.

Quick Starting: The simplicity of the Bethlehem system of starting and reversing makes the engine particularly desirable for service where trained engineers are not available. Only a few minutes are required to start from cold condition, as against several hours to raise steam in a boiler.

No Stand-By Losses: When the engine stops, the fuel consumption stops.

Saving in Labor: Overhauling of boilers, steam and water piping are eliminated and boiler and engine room forces are reduced.



BETHLEHEM STEEL COMPANY *General Offices:* **Bethlehem, Pa.**

District Offices:

New York, Buffalo, Boston, Cleveland, Detroit, Philadelphia, Cincinnati, Chicago, Baltimore, St. Louis, Washington, San Francisco, Atlanta, Los Angeles, Pittsburgh, Seattle, Portland

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM

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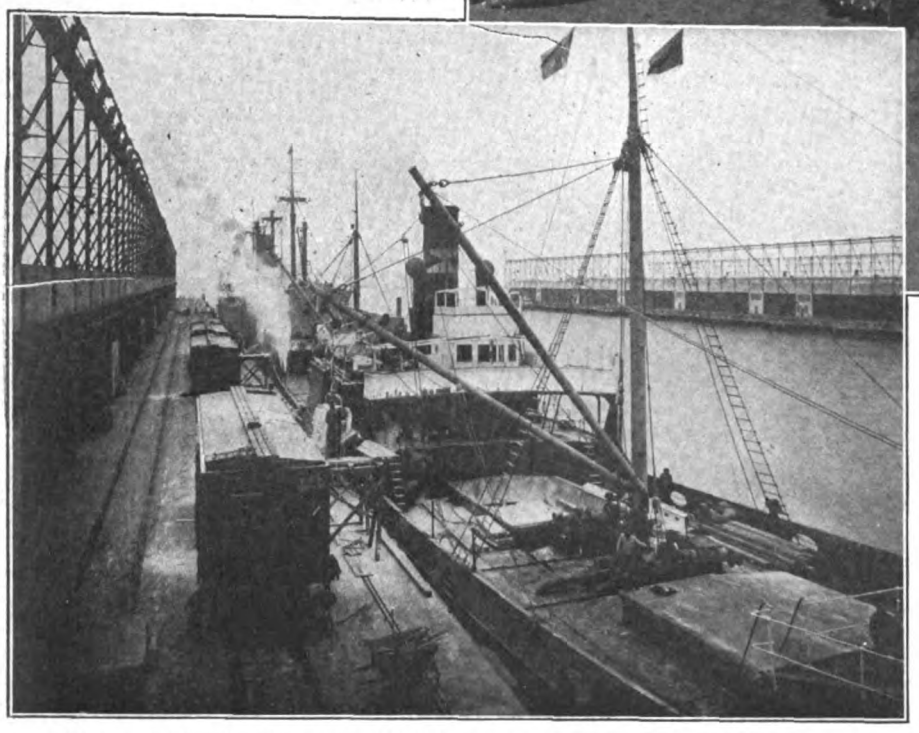
Norfolk Modern Port

(*Continued from Page 25*)

per, automobiles, parts and accessories, cotton mill waste, flour, lard, and other provisions.

Hampton roads is the world's greatest coal port, America's largest tobacco port, its fourth cotton port, and is fifth among all the nation's ports in foreign commerce, being surpassed only by New York, New Orleans, Philadelphia and Baltimore in this respect, and it is steadily growing.

UP-TO-DATE METHOD OF MOVING COTTON FOR EXPORT AT NORFOLK, VA.



CHINA CLAY IMPORTED AT NORFOLK, VA., DISCHARGED FROM SHIP TO RAILROAD CARS

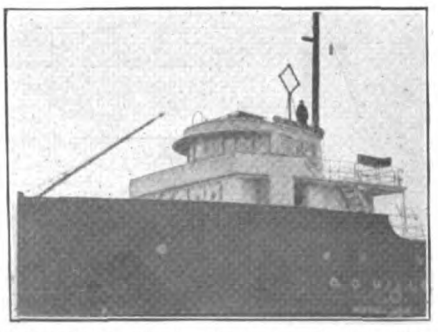
The import commodities include fertilizer materials, nitrates, kainite, potash, phosphate rock, from South America, Germany and France; wood pulp, newsprint paper and iron ore from Scandinavian countries; copper and manganese ores from the West Indies and South America; mahogany logs from Central America and Santa Domingo; coffee, hides, and tanning extract from South and Central America; salt from the West Indies, Africa and Mediterranean ports; vegetable oils from the Far East and the Philippines; large quantities of asphalt, crude and refined oils from Gulf ports and Mexico; fruits and molasses from Cuba, the West Indies and Central America; jute bagging from the United Kingdom; toys from Belgium and Germany; and many other articles. Shipment to the interior from Norfolk is particularly advantageous.

Radio Direction Finder on the Lakes

BY GEO. E. COLE

THE past season of navigation on the Great Lakes witnessed a remarkable application of radio, which, although not as spectacular as the apparently sudden growth of broadcasting, is relatively as important in its scope of providing an additional aid to navigation.

Reference is made to the radio direction finder, whose characteristic loop atop its supporting tripod made its appearance over the pilot houses on forty odd lakers with the opening last spring, following contracts awarded the Radio Corp. of America by the Interlake Steamship Co., Pittsburgh Steamship Co., Harvey H. Brown & Co., Shenango Steamship Co. and others whose courage and faith in the equipment made possible the largest job of its character ever undertaken at one time. Each installation was complete and ready for calibration at the opening of navigation in spite of the unusually severe winter.



MOUNTING LOOP STRUCTURE ON THE D. O. MILLS OF THE INTERLAKE STEAMSHIP CO.

Installations of direction finders were made on assigned vessels laid up in Lake Erie ports and at South Chicago, Ill. Calibration of the instruments were in most cases accomplished as the vessels moved for their first northbound cargo. Through the courtesy and co-operation of Capt. C. A. Parks, superintendent of lighthouses at Detroit, the radio beacon

The author, George E. Cole, is superintendent, Great Lakes division, Radio Corporation of America, Ohio company.

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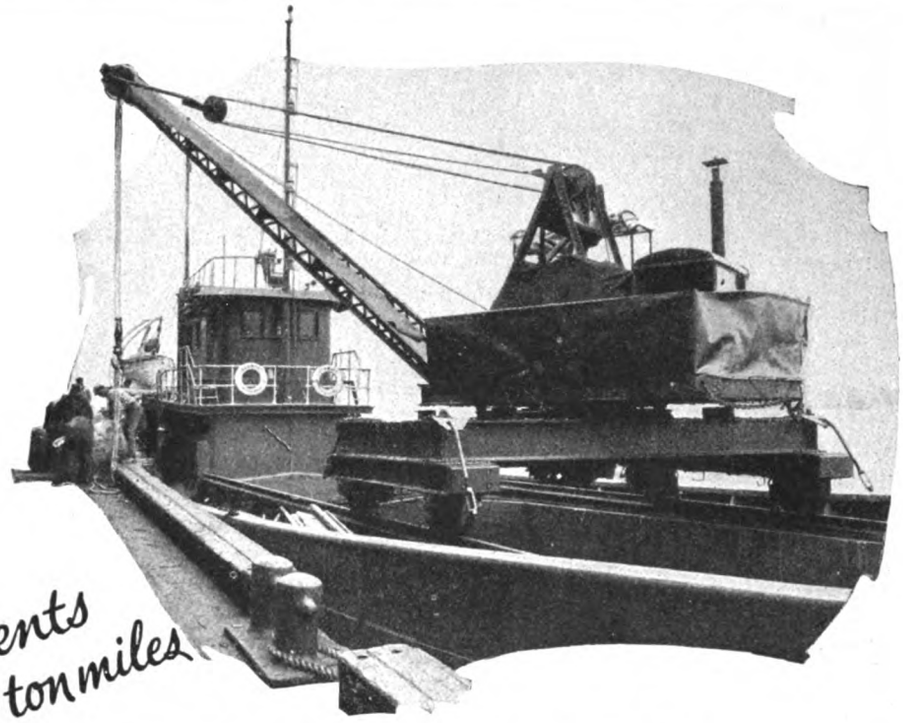
New Motor Vessel
"ECKMUHL"

Owned and operated by the Philadelphia Packet Line. L.O.A. 150'; W. 25'; D. (loaded) 14'. Powered with a 450 B.H.P. Nelseco Diesel Engine, Type 6 MIR-22. Capacity 400 Tons.



2¾ Cents per 100 ton miles

A unique packet service made possible with this new Nelseco-powered vessel

A NEW type of coastwise freighter has just been put in service between Philadelphia and New York. This Diesel-powered vessel "Eckmuhl" not only picks up cargoes from factories located at tidewater but delivers them either to distributing warehouses or direct to ocean steamers in New York harbor.

This unique freighting service has been made possible—and profitable—due to the fact that the vessel is fitted with the latest, fuel-saving type of Diesel power unit—a 450 B.H.P. mechanical injection Nelseco engine, Type 6 MIR-22.

On one-way from Philadelphia to New York—a distance of approximately 255 statute miles—total fuel costs have averaged only 28 dollars. With cargoes of 400 tons this means a fuel expense of only 2¾ cents per 100 ton miles . . . truly a remarkable record.

Nelseco engineers will gladly tell you about other interesting Nelseco installations and give you astonishing figures on the low operating cost of Diesel engines. Write for Pamphlet MR.

NEW LONDON SHIP & ENGINE COMPANY
Groton, Conn., U. S. A.

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H. JACOBSEN
25 North Dearborn Street

New York Sales Office
247 Park Avenue, New York

West Coast Representative
KING-KNIGHT CO.
Seattle, San Francisco, Los Angeles

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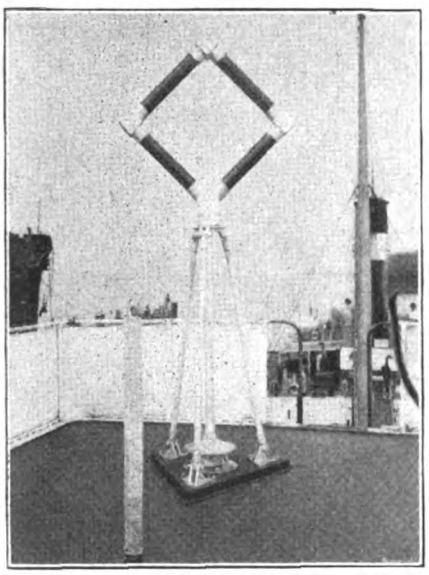
at Bar Point light was operated whenever requested for calibration purposes—a whistle code being arranged for the purpose—and day after day vessels swung three or four miles off the light as simultaneous pelorus and radio bearings were taken to check and compensate for error.

The results of the past season have fully demonstrated the radio direction finder's value as an aid to Great Lakes navigation and particularly is this true on Lake Superior where fog and low visibility were unusually prevalent. In the complete records of over 1300 radio observations from 24 vessels may be found a story of consistent, reliable operation which, in the first year of widespread use on the Lakes, has insured for the instrument a permanent place as standard navigation equipment.

Radio beacons, each emitting its characteristic signal have been operated on the Great Lakes by the lighthouse department during this past season at Buffalo light, N. Y., Bar

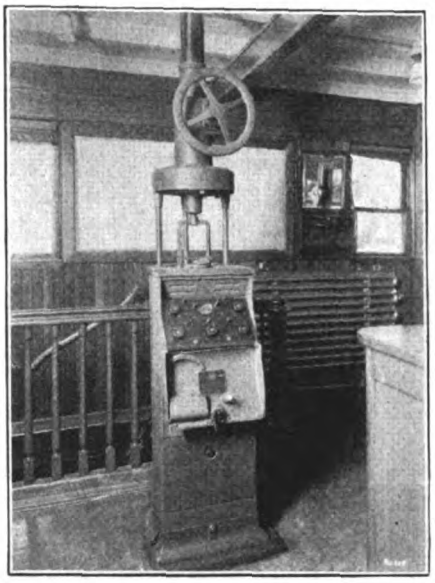


THE LOOP IS RUGGED TO PREVENT DAMAGE BY STORM ICE OR SHIP'S ROLLING. THE TRIPOD CARRIES ALL THE WEIGHT WHILE CENTER SHAFT SERVES AS ROTATING CONTROLS AND TO CONDUCT WIRE TO RECEIVER BELOW

Point light, Lake Huron lightvessel, Detour light, Whitefish Point, Manitou island and Devil's island. A radio beacon at Thunder Bay light, Lake Huron, came into operation early last December. The points under construction or projected for radio beacons include Chicago, Milwaukee, Lansing Shoal and Passage island.

In commenting on the proposed installations a year ago, the editor of MARINE REVIEW in a letter to the writer said:

"Anything of real genuine merit



RADIO DIRECTION FINDER MOUNTED IN PILOT HOUSE—COMPENSATOR BELOW CONTROL WHEEL CORRECTS FOR ERRORS BY SHIP'S RIGGING AND SPARS

in adding to the safety of navigation is bound to be adopted. Nothing can prevent it. The main thing, however, is that such apparatus when put out should be so carefully made and so thoroughly inspected, that it will continue to give satisfaction and will be easy of operation."

This idea of accuracy and attention to detail is the heart and soul of direction finder work, and it is with a distinct sense of satisfaction that the efforts and results of this season have insured not less than 125 additional Great Lakes installations of radio direction finders to be made during the coming winter, by the Radio corporation.

December Lake Levels

The United States Lake survey reports the monthly mean stages of the Great Lakes for the month of December as follows:

Lakes	Feet above mean sea level
Superior	601.68
Michigan-Huron	578.26
St. Clair	574.05
Erie	571.45
Ontario	245.42

Lake Superior is 0.07-foot lower than in November and it was 1.43 feet higher than the low December stage of a year ago. Lakes Michigan-Huron are 0.04-foot higher than in November and they were 0.72-foot higher than the low December stage of a year ago. Lake Erie is 0.07-foot lower than in November and it was 1.06 feet higher than the low December stage of a year ago. Lake Ontario is 0.18-foot higher than in November and it was 0.87-foot higher than the December stage of a year ago, 0.23-foot above the average stage of December of the last ten years.

Launch Large Motorship at Federal Shipyard

The new motorship GULFPRIDE, a 17,400 deadweight, twin screw bulk oil tanker, building for the Gulf Refining Co., was launched on Jan. 20 at the yard of the Federal Shipbuilding & Dry Dock Co., Kearny, N. J. Mrs. J. E. Nelson, wife of the treasurer of the Gulf Refining Co., acted as sponsor.

The GULFPRIDE is especially interesting on account of being the first vessel built in this country on the new Isherwood bracketless system of hull construction, and is also the largest so far constructed on this system in the world.

The vessel is 544 feet long overall with a beam of 74 feet and a molded depth of 40 feet 6 inches. There are 10 main cargo and 10 summer tanks with a total capacity for over 6,000,000 gallons of oil or gasoline. The deadweight capacity is 17,400 tons on a 28-foot draft.

The propelling machinery consists of two Bethlehem four-cylinder, 2-cycle, single acting diesel engines of 2000 shaft horsepower each, which will give the vessel a speed of 11 knots. All auxiliary machinery, including the cargo oil pumps, will be electrically driven and special mechanical ventilation is provided in the pump room as protection for gasoline cargo. The vessel will be completely equipped, including such modern appliances as Gyro compass, radio compass, automatic steerer and Lux system of fire protection, and is expected to be ready for sea about April 1, 1927.

Captain Spilman Dies

Capt. John A. Spilman, president of the Maryland Drydock Co., died at Baltimore Jan. 9 at the age of 49. He was a former naval constructor and resigned from the navy June, 1920, to become general manager of the United States bureau of survey and repair.

Increased Facilities

The Air Reduction Co. Inc., New York, recently acquired by long term lease the plants and business of the Commercial Acetylene Supply Co. Inc. on the Pacific coast. These two acetylene manufacturing companies thus taken over are located respectively at Berkley and Los Angeles.

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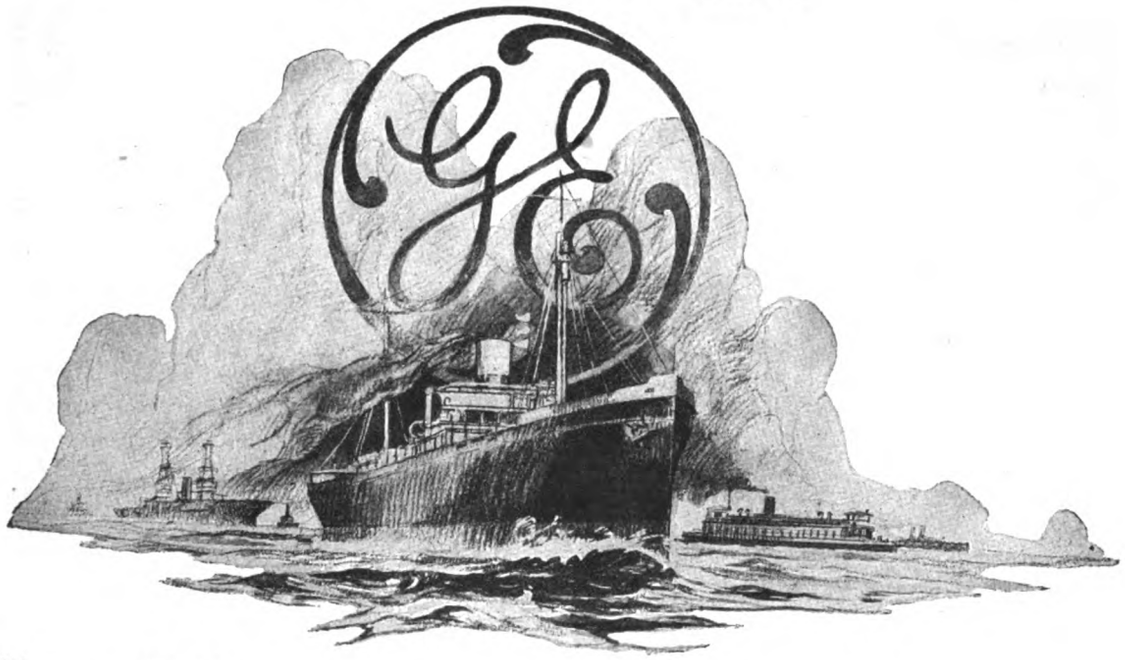

The Honor Roll of Service

STRIKING testimony for turbine propulsion appears on the U. S. Shipping Board Honor Roll; for thirty-three of the fifty ships thus distinguished are equipped with turbine drive.

That 70 per cent of these turbine-driven vessels have G-E equipment is evidence of the quality built into every marine product of the General Electric Company. The equipment for these ships was constructed as part of the war program, and to-day serves adequately the peace-time needs of commercial operation.

This recognition of performance is given only to ships which have traveled at least 20,000 miles during the six-months period, with a rating for sea and port efficiency of 95 per cent or better.

General Electric marine equipment has been successfully applied to many forms of ship propulsion as well as to auxiliaries. Among the G-E equipped vessels are:

Trawlers
Towboats
Ferryboats
Fuel Ships
Battleships
Passenger Liners
Coast Guard Cutters

Dredges
Tankers
Tugboats
Fire Boats
Cargo Boats
Bulk Freighters
Airplane Carriers

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Smaller Diesel Engines

(*Continued from Page 27*)

When the push rod moves over towards the pivoting point of the rocker the movement of the push rod approaches zero. The pump plunger, of course, is operated through a cross head to which the push rod is connected. This system of fuel control gives very find gradations of the amount of fuel which is injected and the arrangement used is even simpler than where a suction valve must be controlled in order to measure the amount of fuel to be injected.

Fuel Supply Is Under Pressure

The fuel supplied to the suction valves is under a pressure of five pounds. This is obtained by having the gear pump which supplies the fuel to the auxiliary fuel reservoir on the engine operate against a spring loaded relief valve. In other words, when the fuel pressure builds up to the five pounds, the excess fuel which is pumped by the gear pump overflows back to the main supply tank. By having the fuel under pressure the cylinders of the injection pumps are positively filled on the opening of the suction valve and there is no possibility of the pumps becoming air bound or of not discharging the full amount of fuel called for by the particular governor setting.

There is no starting control wheel for this engine since it is built non-reversing and all that is required is a quick opening air valve in the air line to the pipe which leads to the starting valves. The governor setting is changed by means of a small hand wheel.

It requires several turns of the governor wheel to effect any substantial change in the speed of the engine and so a manual control is provided. There is the small knob on the upper left hand side of the governor housing. This works directly on the governor control shaft and therefore changes the setting of the injection pump plunger stroke to control the engine speed below that for which the governor is set, without changing the setting of the governor springs.

For most marine maneuvering service it is probable that the manual control will be used exclusively. When however, it is necessary to operate the engine for any length of time at reduced speeds it is advisable to set the speed by means of the governor control wheel. The manual control is also used for shutting the engine down and for any quick changes of speed where the load remains reasonably constant.

Another important feature of the new line of marine diesels is the use of a built-in automotive type transmission which gives two speeds forward and one reverse. With the transmission set for half speed operation and the engine turning over at half speed, the propeller turns at one-fourth full speed. At such a speed as this it would be possible to operate a fishing boat all day for trolling and still have the engine operate economically. Full power and full speed of the engine is used for reversing which is also another feature of the design.

This transmission is built with the same refinements that are used in building the engine and all gears are case hardened and every part is built to the highest specifications. In other words, it is not just a transmission which is added on to the engine as is the case in so many jobs of this type. Since the clutch is of the multiple disk type and there are no friction bands or small planetary gears in the transmission assembly, it is practically indestructible and may be operated for unlimited periods in reverse without overheating. This will be an important consideration from the standpoint of the user since there has sometimes been more trouble with transmissions and clutches than there has been with the engine itself.

As previously mentioned this line of engines will also be built as diesel generating sets. One of these, the four-cylinder of 36 kilowatts, is shown in one of the accompanying illustrations. The engine is the same in all details with the exception that the bilge and circulating pumps are not used and the compressor may be operated unloaded except at such times as it is desired to fill the air starting tanks.

Made Chairman of Agwi

The directors of the Atlantic Gulf & West Indies Steamship lines on Jan. 5 elected H. H. Raymond, president of the Clyde & Mallory Lines as chairman of the board of directors, to succeed the late Galen L. Stone. The board also elected Franklin D. Mooney president of the Agwi lines, to succeed Mr. Raymond as head of the Clyde & Mallory units. Mr. Mooney thus becomes president of all the Agwi lines and its subsidiaries. Robert G. Stone was elected a director of the Agwi board and subsidiary groups, succeeding his father, the late Galen L. Stone.

Winton Executive Visits European Diesel Plants

George W. Codrington, vice president and general manager of the Winton Engine Co., Cleveland, returned on the BERENGARIA recently from a six weeks' business and pleasure trip to Europe. Mr. Codrington had a most interesting trip and enjoyed especially the time spent at the plants of some of the European diesel engine builders. At all of the various

GEORGE W. CODRINGTON
Vice President and General Manager Winton Engine Co.

plants which he found time to visit, he was treated with the utmost courtesy and consideration. "The leaders in the diesel engine industry abroad are certainly a progressive, high grade group of men," said Mr. Codrington. "Coming into close contact with them, getting their viewpoint on various features of diesel engine designing and building, of interest and special significance to me, was a rare privilege, and to partake of their unexpected and cordial hospitality a never-to-be-forgotten pleasure."

Mr. Codrington visited the following plants: Germania Werft, Kiel, Germany, where the Krupp diesels are built; M. A. N. diesel plant at Augsburg, Germany; Sulzer Brothers Ltd., makers of the well known Sulzer two-cycle diesel engines, whose plant is located at Winterthur, Switzerland; Krupp Steel plant, at Essen, Germany. His itinerary included Hamburg, Berlin, London, Glasgow and Paris. He returned to Cleveland benefited by the trip and with more confidence than ever in the future of the diesel.

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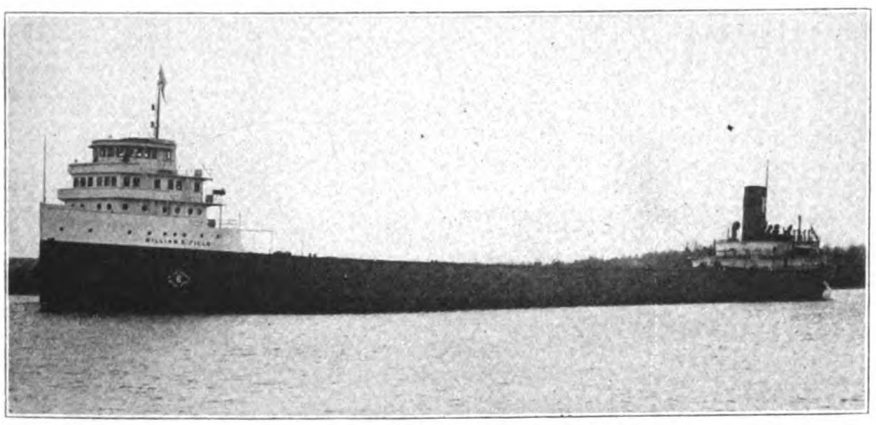
Toledo Shipbuilding Company Inc.

TOLEDO - - - OHIO

Builders of the World's Record Cargo Ship



Steamer William K. Field

604 ft. Long, 60 ft. Beam, 32 ft. Depth. Deadweight Tonnage 12000.

OVER half a million tons of freight carried—forty six cargoes of ore and coal delivered in seven months and seventeen days by the steamer William K. Field.

This remarkable performance earned her the title, "Champion Freight Carrier of the World". During the season 1924 on the Great Lakes she registered a total of 552,014 tons. *An unprecedented accomplishment!*

The William K. Field is owned and operated by Reiss Steamship Company, Cleveland, Ohio. Her type of construction permits rapid loading and discharge of cargo. This was an important factor in her record breaking performance.

Builders and Repairers of Ships and Engines

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Fit Diesels in Tanker

(*Continued from Page* 38)

bank of cylinders directly connected with the cargo oil tank as indicated on its name plate. The carbon dioxide passes through pipes to the space afire and is ejected through special nozzles, the liquid CO_2 changing instantaneously to a gaseous state and in so doing expanding to 450 times its original stored liquid volume. Gas can be discharged in any amount necessary to extinguish fire in less than 30 seconds from time applied.

The E. T. BEDFORD is a 15,300-deadweight vessel, 516 feet 6 inches long, 68 feet wide and with a molded depth of 30 feet 10¼ inches. She was built in 1921 by the Federal Shipbuilding & Drydock Co., at Kearny, N. J., and the same company installed her new diesel propelling equipment. The E. T. BEDFORD is a sistership of the S. S. J. A. MOFFETT JR. which the company plans to convert to diesel engine drive in the near future at a convenient time.

Recent Sales of Ships

SALES of government tonnage during the calendar year 1926 totaled 91 cargo ships aggregating 621,093 deadweight tons and 5 passenger-cargo vessels aggregating 70,730 gross tons, according to the statement prepared by the ship sales department of the Emergency Fleet Corp. The total cash consideration for these sales was $14,366,996.80.

In addition to the sale of ships, the board disposed of five drydocks for the sum of $420,000. All of these sales were made in accordance with the provisions of the merchant marine act of 1920 and were in furtherance of the policy of transferring our merchant shipping to the control of private American citizens.

The sales for operation, as all of those during 1926 were, were in approximately the same volume as similar sales made during 1925. During that year, however, 199 ships were sold to the Ford Motor Co. for scrapping.

The 1926 transactions included the sale of 17 cargo vessels, of 141,063 deadweight tons total, and all the passenger-cargo ships mentioned to private American interests under contracts that the ships shall be operated over specified routes in our foreign trade for periods of five years. The passenger-cargo ships, which comprised the American Oriental Mail line, running from Seattle to the Orient, were sold to the Admiral Oriental line of Seattle for the sum of $4,500,000.

Two complete services made up the principal part of the cargo ships sold for restricted operation. The American South African line, comprising five vessels with 42,978 deadweight tons, was sold to a newly formed concern, the American South African line, Inc., for $777,901.80. This line covers American ports on the North Atlantic and ports of the South and East coasts of Africa. The Pacific, Argentine and Brazil line, with 6 vessels aggregating 51,403 deadweight tons, was sold to a new corporation bearing its name. Consideration for this sale was $295,515.50. Its operation over a route covering Pacific ports of the United States and ports on the East coast of South America is likewise guaranteed for a five-year period. Other sales for restricted operation included two 8400-ton ships to the Export Steamship Corp. for use in the New York-Mediterranean and Black Sea trade; three 8500-ton ships to the Grace Steamship Co. for the West-South American trade; and one 4100-ton steamer to the Colombian Steamship Co. Inc. for the West Indian trade. The total sales of cargo ships for use on established trade routes brought $1,376,775.80.

Cargo vessels sold for operation "as is" numbered 39 with an aggregate deadweight tonnage of 238,428. The prices for these vessels totaled $3,866,729. Sales under agreement of the buyer to perform certain repairs or effect betterments to the ships numbered 23. The tonnage of these vessels amounted to 139,003 deadweight tons, while cash returns were $1,182,040.

The board also sold 12 tankers, of which 5 are to be converted to diesel propulsion. Total tonnage of these tankers is 103,599 deadweight tons, and their aggregate cost to their purchasers, was $3,441,452.

The shipping board has announced the following particulars concerning the sales of government tonnage:

INSPECTOR, steel steam, single screw tanker for the carriage of molasses, of 7565 deadweight tons, sold to the Dunbar Molasses Co. of New Orleans for the sum of $150,000. The sale followed negotiation based on a bid previously submitted for the vessel. At the time of the sale (Dec. 27) she was laid up at Mobile, Ala.

CABRILLE, DARDEN, GLADYSBEE and LILMAR, steel steam, single screw tankers, of 7500 tons deadweight, now laid up, the first two at Mobile, the third at New York and the last at Hog Island. Previous offers were rejected for these vessels, but more recent offers received by the fleet corporation, would seem to justify a further attempt to dispose of them.

AMERICA: Checks and bonds which accompanied bids received Nov. 15 for reconditioning this vessel were ordered returned to the bidders by the board January 4. The bids, however, were not acted upon and are still before the board.

SAG HARBOR, BAR HARBOR, YORK HARBOR and MARINERS HARBOR, single screw steel steam freighters. The shipping board declined an offer by E. Diamond, on behalf of a Boston group to purchase these vessels and to establish a cargo line to the West Indies, for amounts equal to the cost of conditioning the vessels. The cost of conditioning these ships would be substantially less than the value placed upon them by the board.

DONALD G., wooden tug boat, 60 feet in length, formerly owned by the war department, used at New York, but now laid up. This tug is now for sale.

CENTURION, a wooden ocean-going tug, 143 feet in length, now laid up at Orange, Tex. This tug has an 800-horsepower, triple expansion engine and two scotch boilers. Bids for these two vessels will be received by the Emergency Fleet Corp. Feb. 15 at noon.

World Markets

CANADIAN SETTLER, single deck steamship, 4918 deadweight tons, 3548 gross tons, to European buyers for about £19,000.

CAROLINAS, double deck steamship, 6000 deadweight tons, 3513 gross tons, for about $67,500 to Norwegian buyers.

CLAUS HORN, double deck steamship, 4000 deadweight tons, 3368 gross tons, for about £31,000 to British buyers.

GREYSTOKE CASTLE, single deck steamship, 6380 deadweight tons, 3828 gross tons, for about £21,000 to W. S. Miller & Co., Glasgow.

MENOMINEE, three deck steamship, 8150 deadweight tons, 6919 gross tons, for about £14,000 to Italian buyers.

RIVER WAY, single deck steamship, 6200 deadweight tons, 3805 gross tons, for about £36,000 to Japanese buyers.

AKABO, double deck steamship, 4774 deadweight tons, 3839 gross tons, for about £14,000 to United Baltic Corp., London.

BURGONDIER, single deck steamship, 8200 deadweight tons, 5196 gross tons, for about £40,000.

GASCONIER, single deck steamship, 8077 deadweight tons, 5107 gross tons, for about £39,170.

TAXANDRIER, single deck steamship, 8200 deadweight tons, 5162 gross tons, for about £40,000.

Makes a Long Tow in Record Time

A report recently received gives the arrival at Cartagena, Colombia, South America of the ocean-going tug SUSAN A. MORAN of the Moran Towing & Transportation Co. Inc., 17 Battery place, New York, with the sternwheel steamer CASCAJALES in tow on Dec. 30.

The tow left the Delaware river on Dec. 12 and during the trip was delayed approximately three days by extremely heavy weather, a total elapsed time of 18 days with an actual towing time of 15 days. The tow was about 2200 miles, and a noteworthy one for this time of the year.

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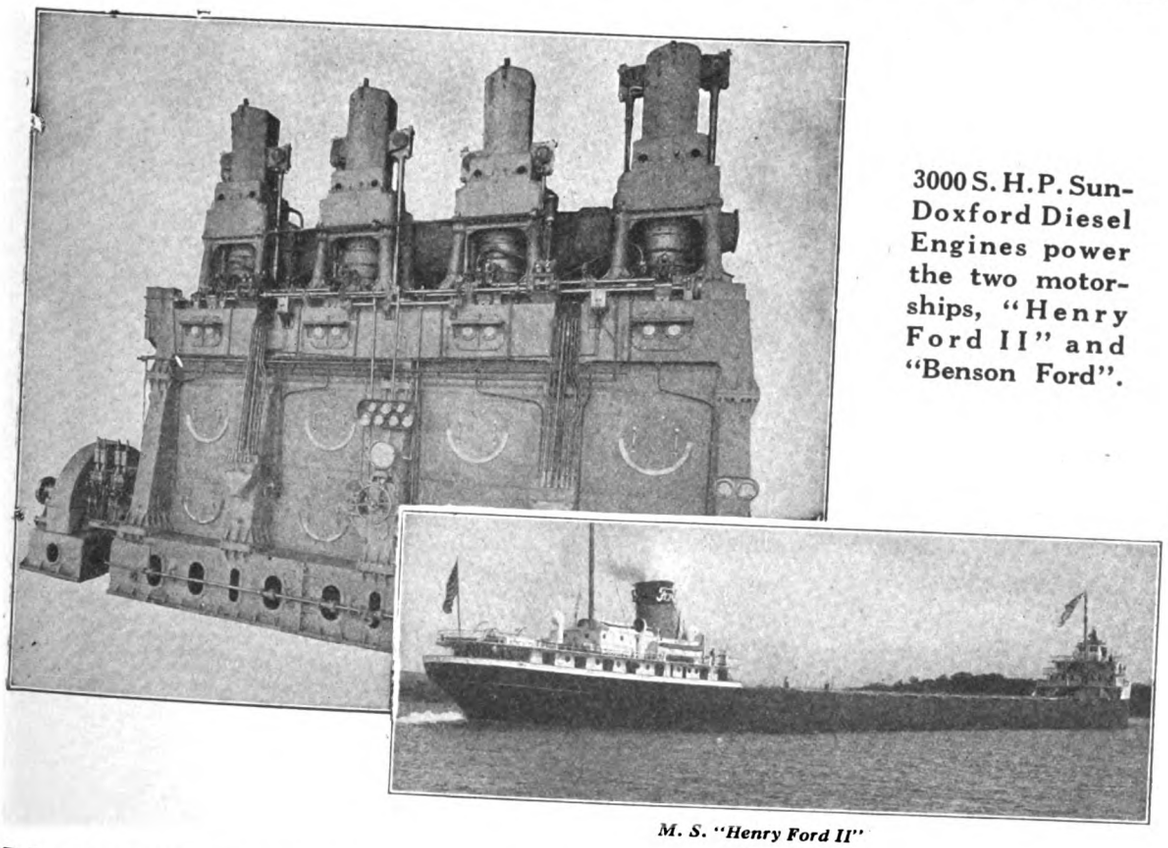
SUN SHIPBUILDING & DRY DOCK COMPANY

Builders of

SUN-DOXFORD DIESEL ENGINES

The Engines that Power

"HENRY FORD II" *and* "BENSON FORD"



3000 S. H. P. Sun-Doxford Diesel Engines power the two motorships, "Henry Ford II" and "Benson Ford".

M. S. "Henry Ford II"

SUN-DOXFORD *and* JUNKERS PATENTS

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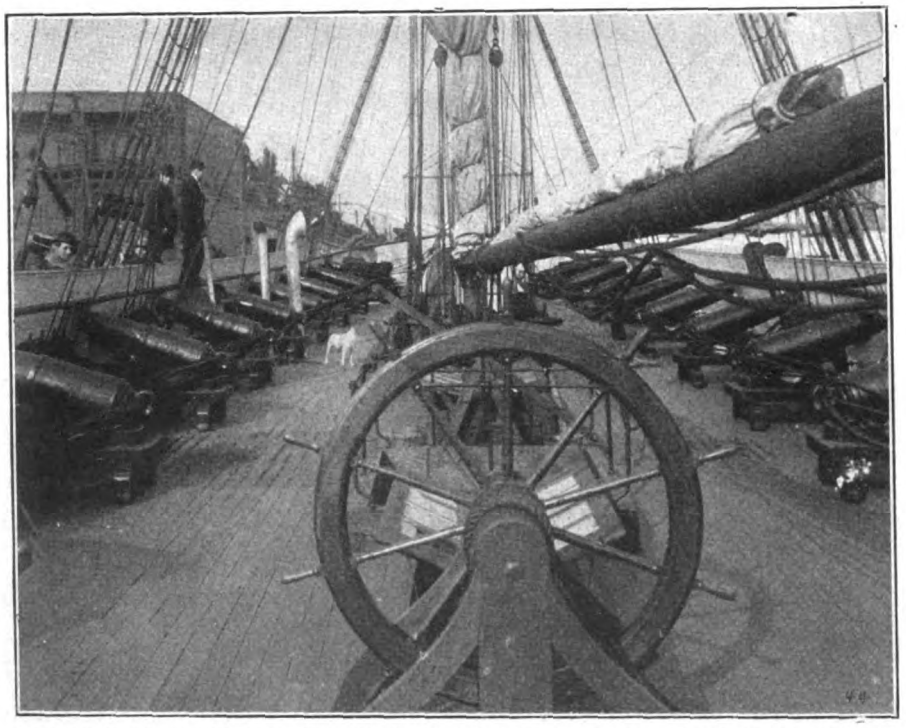


THE RESTORED SLOOP OF WAR NIAGARA SHOWING MOUNTING OF HER CARRONADES

Guns of Old Ironsides

(*Continued from Page* 18)

undoubtedly started long before 1812 and probably extends back at least to 1800.

Writers for years past ,have often mentioned "long 24 pounders" in connection with the battery of the CONSTITUTION and other vessels of her date. Marshall's table shows no such gun. The designations of "long" and "short" apply only to 6 pounders, 9 pounders, and 12 pounders. It is possible of course that all guns from 18 pounders and upward, were actually long guns. The size of the bores of these cannon were slightly more than the size of the "round shot'" used in them; this difference in size allows the powder flame to envelop the shot, and this insures the ignition of the fuse. The term "windage" is given to the clearance space between bore and the shot. The diameter of the bore of a 24 pounder for example, was 5.8 inches, and of the round shot 5.7 inches; the "windage" is therefore one-tenth of an inch.

Howitzers for firing shells at long range were invented in 1812 by Colonel Bomford, but none were installed on the CONSTITUTION. It was not until some 28 years later that these "novelties" were again used. Capt. William H. Parker tells us in his *Recollections*, that at that late day 1839-40, naval officers regarded howitzers with suspicion. It was often a matter of grave discussion with the division officers whether the fuse went in first or the "sabot"; whether the fuse should be ignited before putting the shell in the gun or not!

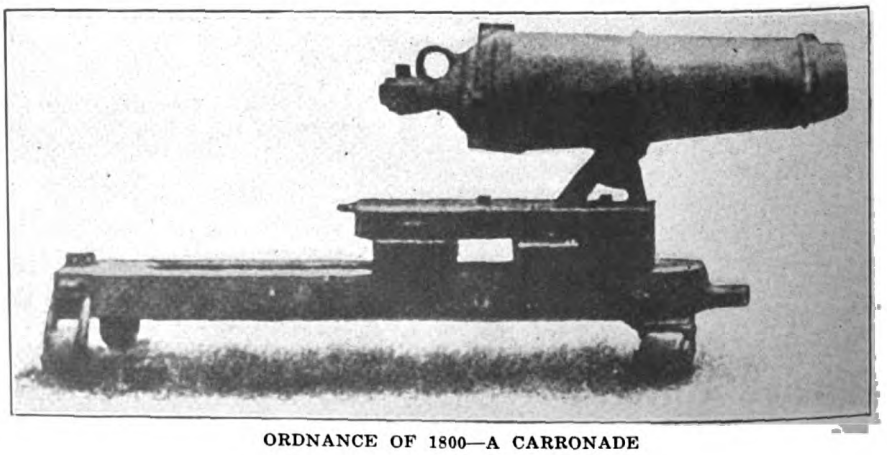
Carronade Described

The carronade which is so often spoken of in connection with the battery of the CONSTITUTION *and other vessels of her day was "a cannon of peculiar construction, much shorter and lighter than the common cannon and having a chamber for the powder like a mortar; they are generally of large caliber and carried on the upper works as the poop and forecastle. They derive their name from Carron in Scotland, where they were first made" (Mariners' Dictionary,* 1805). *The guns shown in view of the spar deck of the sloop* NIAGARA, *one of Perry's fleet that fought at the Battle of Lake Erie—since raised and restored—gives a good idea of this type of gun.*

The time honored method of instruction by question and answer was used in George Marshall's book. We thus find out how to cut "flannel cylinders" and how to preserve them from being moth eaten on board. When a gun broke loose in a gale at sea, danger to the ship, and possibly to the entire ship's company, had to be faced and overcome. The ready answer given when asked how to meet such a situation was "immediately cut down some of the hammocks and get such other like things to choak the gun and trip it if possible, and secure it with some good rope until the gale abates." If in service on a line of battleship instead of OLD IRONSIDES, we learn that "if a shot fetched away in a gun in bad weather and the tampion is secured above the sill of the port" we should at once "drown the powder with vinegar."

Experience might or might not have taught us, according to our habits of observation, that "with a proper allowance of powder to a 9-pound shot, it flies at the rate of 1 mile in 4 seconds—the elevation 2 degrees." In 1812 the CONSTITUTION did not carry any 9 pounders hence possibly the lack of accurate knowledge that this flight meant 1320 feet in one second of time would not have been disastrous. We would not have been disturbed at all by finding only 90 pounds of powder in a 100-pound barrel or 45 pounds in a half barrel, for it was the practice not to fill them entirely full. But had the dimensions of these barrels varied a hair's breadth from a standard length of 1 foot 9½ inches or had the "bilge" diameter been less than 1 foot 5 inches we might have been so perturbed as to refuse to accept the assignment of powder at its invoiced amount.

The idea of turning one's back to a light in the powder room when "offering to strike the copper hasp of a barrel, lest when facing the light the mallet fly out of one's hand



ORDNANCE OF 1800—A CARRONADE

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The Blizzards that Grip the Northern Coast Steer Clear of Balmy Newport News!

Here Outdoor Construction and Repairing go on economically the year 'round, uninterrupted by bad weather.

At the Newport News Shipyard, it is always warm enough to hammer metal out of doors, all year 'round. So mild is the climate! Thus expensive and inconvenient delays in repair and construction work due to weather are unknown.

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No wonder 300 ships were repaired here during 1926. And no wonder that some 65% of the major ship construction on the Atlantic Coast is now said to be at the yards of the Newport News Shipbuilding and Dry Dock Company. Facilities for building or repairing are vast; labor is efficient and plentiful—your inquiry is invited.

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NEWPORT NEWS, VA.
NEW YORK, 233 BROADWAY

300 VESSELS REPAIRED IN 1926

U. S. Ships	234
British	44
Norwegian	7
Danish	4
Italian	4
Swedish	3
German	1
Spanish	1
Japanese	1
Dutch	1
Total	300

MAJOR CONSTRUCTION IN 1926
(Completed or Building)

Merchants and Miners Freight and Passenger Steamers:
CHATHAM - length overall 368'
DORCHESTER length overall 368'
FAIRFAX - length overall 368'

Panama - Pacific Line, Twin - screw Freight and Passenger Steamer:
CALIFORNIA - length overall 601' 3"

Clyde Line Freight and Passenger Steamer:
MOHAWK - length overall 402' 2"

Clyde Line twin-screw Freight and Passenger Steamers:
IROQUOIS - length overall 408'
SHAWNEE - length overall 408'

Red "D" Line twin-screw Freight and Passenger Steamer:
CARACAS - length overall 335' 6"

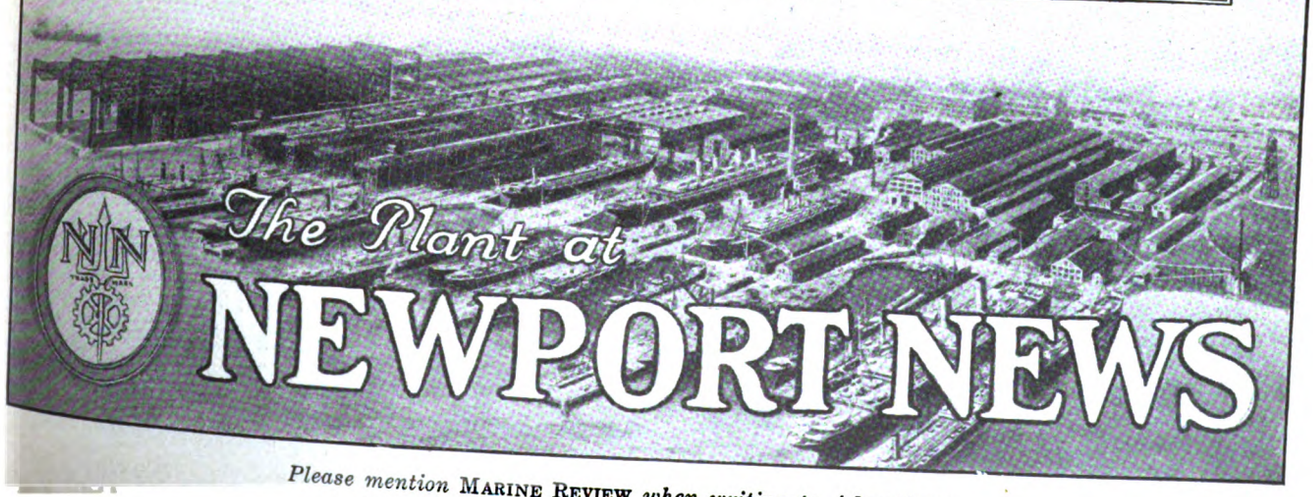
Coast Guard Cutter NORTHLAND

YACHTS

PAWNEE SAVARONA ARCADIA
ARAS JOSEPHINE ROBADOR

MISCELLANEOUS CONSTRUCTION

C & O House Barges, Nos. 10, 11, and 12
C & O Car Float No. 3
P R R Drill Tug Hulls, Nos. 15 and 20



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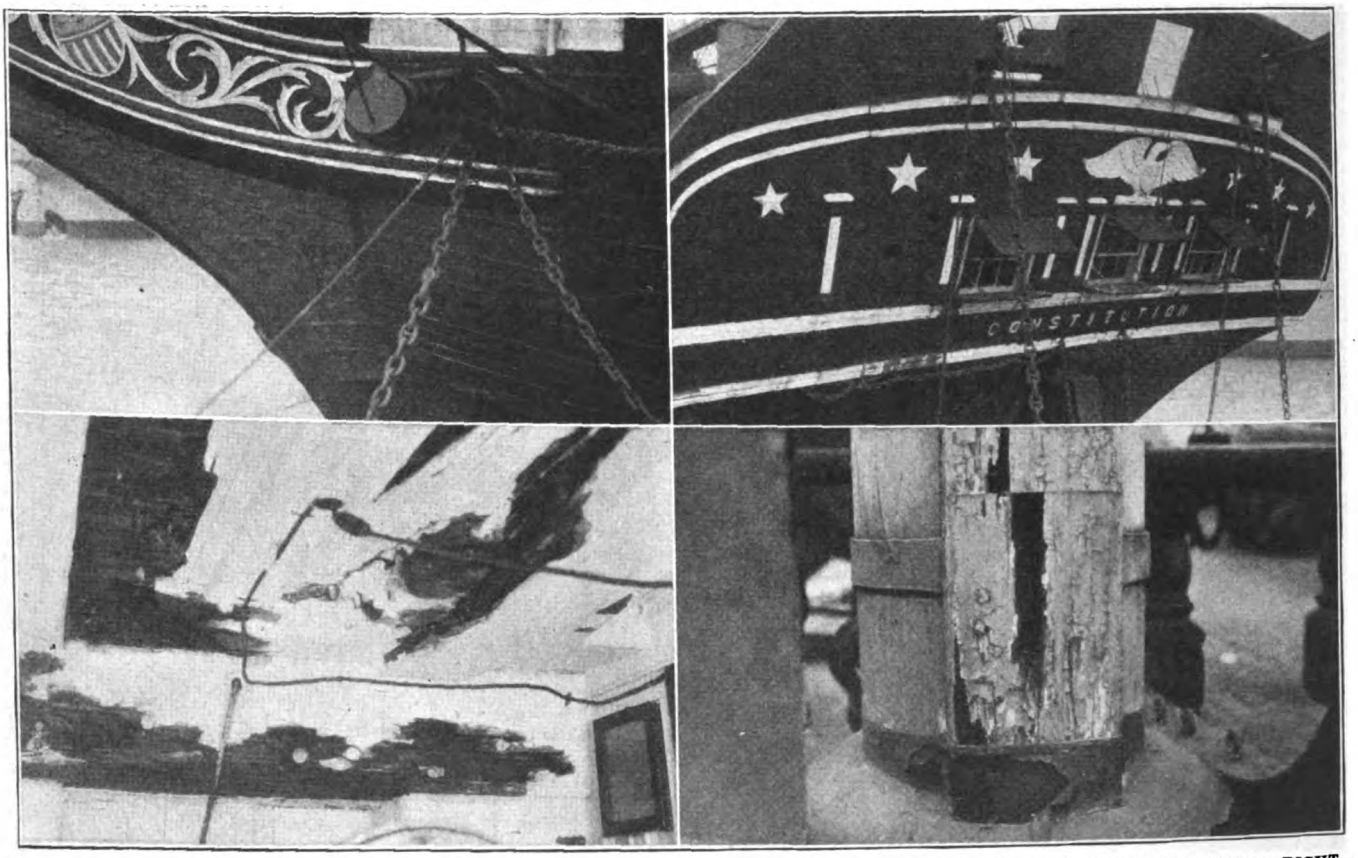

U. S. S. CONSTITUTION SHOWING STATE OF DECAY OCTOBER, 1925—UPPER LEFT—STEM AND HAIR BRACKETS—UPPER RIGHT—STERN TRANSOM—LOWER LEFT—CABIN STARBOARD SIDE OVERHEAD—LOWER RIGHT—FOREMAST ABOVE SPAR DECK

toward the light" appeals to one as being a good one to put into practice. When the drum "beat to quarters" all kept silent, with leathern buckets; all gun locks and tube boxes were made ready. In close action guns were "double shotted" but only one wad was used to one shot. A lee gun was never "kept level while loading" because if the "train tackle" falls or hooks give way the "sponger and loader" men would be crushed between the breast of the gun carriage and the ship's side. The "lee" side is the side opposite to that from which the wind is blowing; the pressure of the wind on the sails makes a vessel heel over "to leeward" and hence a "lee gun" has a natural tendency to take charge and roll outward toward the ship's side.

As to the rapidity of fire attained in these days, the log book of the frigate CONSTITUTION shows that during the attack on Tripoli, she fired eleven broadsides of round and double headed shot from her "larboard" guns in 40 minutes. Her modern counterpart will fire a salvo of 12-inch guns at intervals of scarcely more than one-tenth this time, the energy of each of these modern guns is more than equivalent to the entire broadside of OLD IRONSIDES. In those days, orders were given slowly and deliberately "Handle your match," "blow your

GUN deck of the U. S. S. CONSTITUTION, port side looking forward. Photograph taken March 8, 1925 at the Navy Yard, Boston. On this deck OLD IRONSIDES carried fifteen 24 pounders on each side —30 in all. Her gallant crew fought here in their bare feet, trousers rolled up to the knee, and with the decks wet down. The capstan for heaving up her anchor is to be seen near the ladder in the right foreground. Just forward of the capstan is the old brake handled bilge pump for clearing the hold from water.

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¾"	"	"	"	1⅜"	"
1"	"	"	"	1½"	"

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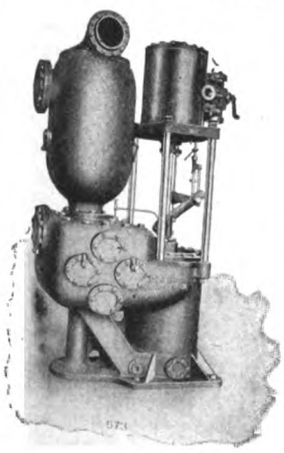

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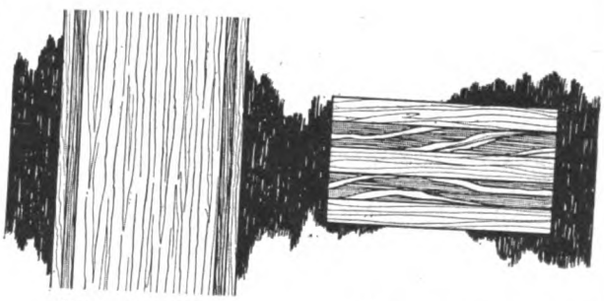

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match," "stand by," "fire." Now a quick pressure on an electric button fires an entire broadside.

The slogan of labor unions today is "A fair day's wage for a fair day's work." Had the use of this phrase been attempted aboard ship, in the days of OLD IRONSIDES the speaker would have found it of little avail. The amount one man could do was known and tabulated. One gun could be completed and made ready for service including scraping, cleaning and painting, every 37 days. Thus, "it was one day's work for one man" to put "beckets" without covers to 25 "shot racks" or to "muzzle bags." When it came to making up "rockets," and "false fires," the day's quota was four sky rockets or 12 "false lights." In short, summing up all such operations it required 37 man-days work to make one gun ready for service.

Little more remains to be said on the subject of the guns and gunnery practices of this former "redoubtable enemy of Great Britain." Before closing this tale, which is neither a yarn nor a silly fable, a word of caution and another of appeal will be added. During the coming reconstruction of OLD IRONSIDES one must not be too dogmatic as to detail; adherence to fact, wherever the data warrants it, is, however, to be recommended, provided sufficient funds are available.

Hereafter at high noon, every fourth of July, may a salute of 21 guns be broadcast the world over from the deck of the CONSTITUTION. May the swelling notes of our national anthem come from her quarterdeck and reverently be listened to throughout our broad land. On the nation's birthday, let there be projected on every screen, a moving picture of a model of the CONSTITUTION underway firing a salute to the nation. Such a picture can easily be made and still not be a mere trick of photography. The model shown in one of the illustrations in part I of this article in the October 1926 MARINE REVIEW was sailed at Portsmouth, N. H. in 1922—why not again? May the readers of this tale, number themselves with those who "seeing many things, observeth; opening their ears, heareth; whose tongues are loosed and speaketh," to the end that the call of OLD IRONSIDES may again echo to the nation on the fourth of every July.

U. S. Diesel Conversion

With the successful completion and trial of the shipping board converted freighter, WEST CUSSETTA, on Jan. 14 by the Fore River plant of the Bethlehem Shipbuilding Corp., the fourth shipping board freighter has now been converted. The others are the motorship TAMPA, motorship UNICOI, and motorship WEST HONAKER. The first two of these were reconditioned at Newport News and have double acting Worthington diesel engines. The last two, that is the WEST HONAKER and WEST CUSSETTA, were both reconditioned at the Fore River plant of the Bethlehem Shipbuilding Corp. and have installed McIntosh & Seymour diesel main engines and auxiliaries.

Complete illustrated stories appeared on the TAMPA and the WEST HONAKER in the December and January numbers respectively of MARINE REVIEW.

The WEST CUSSETTA, immediately after her trial, sailed from the army base, Boston for New York to load cargo for Australia, replacing the EASTERLING. It is said that the conversion will enable the motorship WEST CUSSETTA to reduce the cost of the trip by about $25,000.

Two Vessels Launched

The CITY OF MONTREAL, and the CITY OF HAMILTON, two large steel freighters were launched from the shipyard of the Midland Shipbuilding Co. at Midland, Ont., on Jan. 12, the ice from the bay having been removed by a powerful ice breaker. Work on both ships was started at the same time and from 300 to 400 men have been employed on their construction. They are 238 feet over all, 38 feet in beam, and 23 feet deep, and will have a speed of 12 miles per hour. Each of the vessels is equipped with triple expansion engines, and two boilers 13 feet 6 inches in diameter will generate the steam. The engines were built in England and the boilers in St. Catharines. These vessels will operate on express service for the Canada Steamship line between Montreal, Toronto and Hamilton. The keels for two more vessels are being laid down.

The new steel carferry MADISON, building at Manitowoc Shipbuilding Corp., Manitowoc, Wis., for the Grand Trunk railway was successfully launched, Wednesday, Jan. 19. The MADISON is similar to the GRAND RAPIDS launched last fall.

Alexander McNab, president of the McNab Co., formerly of Bridgeport, Conn., is now located at 1 Broadway, New York city.

World Shipbuilding Will Recover

A sharp decline in the world's production of merchant vessels marked 1926, launchings for that year totaling over half a million gross tons less than in 1925, says a statement recently issued by Lloyd's Register of shipping, covering returns from all countries for ships of 100 gross tons and upward.

While the launchings for 1926, aggregating 1,674,000 gross tons, were only about half the total for the last pre-war year, 1913; they were less than a quarter of the figure for the post-war peak year, 1919; and, with the exception of 1923, the 1926 total is less than for any year since the war, Lloyd's Register points out.

The United States was one of the few countries to show a gain last year, in comparison with 1925. Great Britain and Ireland's shipyards showed a pronounced loss in the total of tonnage launched in 1926, and a decline, but a much smaller one, was made by the other maritime countries, taken together.

The comparison of the launchings for the last two years is shown in the following table, prepared by Lloyd's, the figures representing gross tons:

	1926	1925
United States	150,613	128,776
Great Britain & Ireland	639,568	1,084,633
Other countries	884,796	979,995
World Total	1,674,977	2,193,404

As against the drop of 518,000 gross tons for all countries during the last year, the 1925 total shows a decrease of only 54,000 tons from that for 1924. The 1926 figure, however, is only about 30,000 above the low mark registered in 1923, of 1,643,000 tons.

The American Brown-Boveri Electric Corp. announced recently the appointment of Thomas R. Allen as assistant works manager. Mr. Allen will direct all shipbuilding activities under Mr. Newell, manager.

The Beacon Oil Co. in adding the 435-foot steamship, the BEACONHILL, to its fleet, continues its expansion program which was started during the past year. The BEACONHILL has a deadweight displacement of 10,000 tons. She is driven by a 3000-horsepower engine at a speed of approximately 11 knots, and will be used for the transportation of crude oil from the Gulf of Mexico to the Beacon refinery at Everett, Mass.

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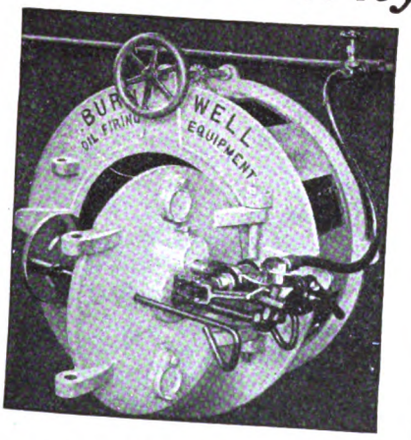

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Lake Shipyards Busy

(*Continued from Page* 22)

type of bulk freighter is among the nine referred to. This vessel also will be a stone carrier and is under construction by the American Ship Building Co. at Lorain, O., for the Bradley Transportation Co. This vessel, 638 feet long by 65 feet beam by 33 feet depth, will be the largest vessel ever built on the Great Lakes. She will be a self-unloader generally similar to the T. W. ROBINSON built at the same yard and by the same owners two years ago.

As at least 25 per cent of the entire power needed for propulsion will be required for operating the self-unloading facilities of this ship, it was decided to adopt what is considered an advanced type of propulsive power, particularly on the Great Lakes, that is, a turbo-generator, supplying power to an electric motor direct connected to the propeller.

A few scows and nonpropelled barges are also under construction. It is understood that inquiries are being made calling for construction of two smaller tankers. The tentative proposals call for diesel propulsive machinery. Several cities of the Great Lakes are more or less seriously considering the addition of a modern fire boat. Whether anything will come of these inquiries is at this writing quite uncertain.

Repairs Not Especially Heavy

Contrary to accepted notions, repair work which always constitutes a steady volume of work for the different plants of the shipyards of the Great Lakes, has been about the same or less this year than a year ago. This despite the fact that an early and severe winter very materially interfered with operations toward the close of the season. Apparently no particular damage was suffered on account of the ice conditions except to propellers of some ships.

On account of new work the Toledo Shipbuilding Co. Inc., Toledo, O., is now employing 945 men as against 315 men a year ago. The other yards have also had an increase in working forces but not in anything like the same proportion.

Shipbuilders Co-operate

FOR the purpose of bringing together into a compact ethical working unit all of the shipyards and ship repair plants of the United States and providing a medium for greater co-ordination of thought and expression on problems of mutual interest the Atlantic Coast Shipbuilders association recently invited one of the senior executives of every shipyard and ship repair plant in the country to serve on a committee which will function in legislative matters and in such association activities that are national in scope and conducted for the benefit of the entire industry. Acceptances were received from 67 shipbuilders and ship repairers, and a committee of that number was formally appointed. The members of the committee will also serve in an advisory capacity to the officers and councilors of the association.

A striking illustration of the expanding spirit of co-operation in the shipbuilding industry and an example of how the newly created committee will function is cited by Secretary King, who described the manner in which shipbuilders and ship repairers of the United States worked together in developing and placing before the country a definite and constructive plan to improve the maritime position of the nation and conserve the shipyards as an important factor in upbuilding and maintaining an American merchant marine.

The bill, which is known as the overseas trade act, was sponsored in the United States senate by Senator George Wharton Pepper of Pennsylvania and is now pending before the senate committee on commerce. Under its terms tariff protection would be extended to shipbuilding.

The personnel of the Atlantic Coast Shipbuilders association's national committee of shipbuilders and ship repairers is as follows:

New England Section—S. W. Wakeman, vice president and general manager, Bethlehem Shipbuilding Corp.; S. W. K. Brooks, president, S. W. K. Brooks Co.; Paul J. Bertelsen, general manager, Atlantic Works; William E. Rice, president, Rice Brothers Corp.; E. A. Morse, president, Noank Shipyard Inc., and L. Y. Spear, president, New London Ship & Engine Building Co.

New York Section—L. H. Korndorff, vice president and general manager, Federal Shipbuilding & Dry Dock Co.; John J. Amory, president, Consolidated Shipbuilding Corp.; W. Parker Runyon, president, Perth Amboy Dry Dock Co.; Henry B. Nevins, president and treasurer, Henry B. Nevins Co.; E .H. Ewertz, general manager, Moore Plant, Bethlehem Shipbuilding Corp.; E. P. Morse, president, Morse Dry Dock & Repair Co.; C. Pliny Brigham, secretary and treasurer, Greenport Gasin Construction Co.; Charles Cooper, president, Chelsea Ship Repair Co.; William A. Hall, president, C. M. Lane Life Boat Co.; George Hutchinson, president, Newburgh Shipyards Inc.; J. A. Dwyer, vice president and secretary, R. Lenahan Co., and Foster L. Hawkins, manager, Port Jefferson Shipyard.

Delaware River Section—H. Birchard Taylor, vice president, William Cramp & Sons Ship & Engine Building Co.; A. W. Main, naval architect, the Pusey & Jones Co.; Clinton L. Bardo, vice president, American Brown Boveri Electric Corp.; Robert Haig, vice president, Sun Shipbuilding & Dry Dock Co.; N. W. Robinson, pesident, Mathis Shipyard Co.; C. W. Weaver, general manager, Harlan plant, Bethlehem Shipbuilding Corp., and John Baisley, president, John Baisley Iron works.

Baltimore Section—James C. Leonard, president, Cambridge Manufacturing Co.; J. Macy Willis, general manager, Baltimore plant, Bethlehem Shipbuilding Corp.

Southern Section—Homer L. Ferguson, president and general manager, Newport News Shipbuilding & Dry Dock Co.; Frank B. Hooper, vice president, Warwick Machine Co.; A. J. Dyer, president, Nashville Bridge Co.; W. G.. Larmour, general manager, Old Dominion Marine Railway Corp.; O. A. Bloxom, president, Southern Shipyard Corp.; George W. Roper, president and treasurer, Norfolk Shipbuilding & Drydock Corp.; J. H. Curtis, president, Gas Engine & Boat Corp.; H. R. Humphreys, president, Humphreys Railways Inc.; W. W. Storm, vice president and general manager, Wilmington Iron works; E. F. Hamme Jr., Hamme Marine Railways Co.; C. V. Boykin, vice president and general manager, Charleston Dry Dock & Machine Co., and J. R. Massengale, president, St. Louis & Tennessee River Packet Co.

South Atlantic and Gulf Section—James C. Merrill, vice president and general manager, Merrill-Stevens Dry Dock & Repair Co.; Ernest Kreher, president and general manager, Tampa Shipbuilding & Engineering Co.; J. F. Taylor, president and general manager, Warren Fish Co.; Warren

(*Continued on Page* 68)

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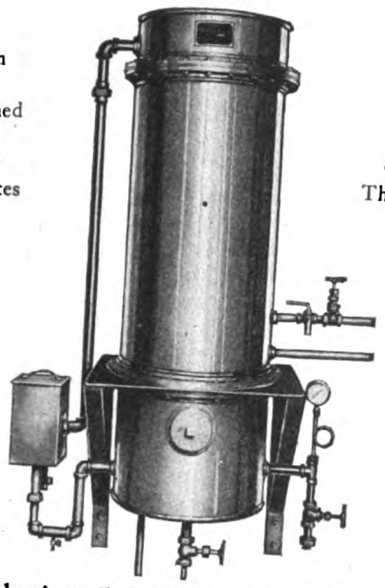

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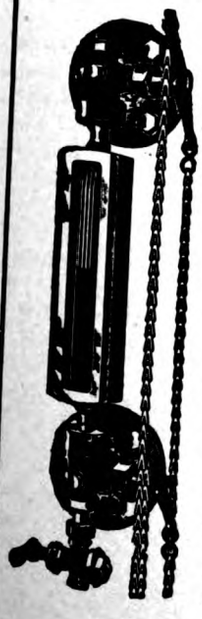

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Reduce Fuel Bill

(*Continued from Page* 16)

full content at any temperature before placing on board and apply the correction for the observed temperature which has to be done in any case.

Referring to Table I the examples are all too few and comprise only these which are defintely certain. Others may exist in the second group but the fact is not, at least to the writer, clearly established. The table is condensed from trial data to which some reference may be made later.

There are three examples, of two different types, in the water tube class and two in the scotch. A third scotch boiler ship in which actual weights are given is rejected because the calculated rate seems too high with the stack temperatures shown. It may be said here that while evaporation from and at 212 degrees per pound of combustible is of course the true basis of comparison, yet the method of ascertaining the weight of combustible in all the tests is open to very serious errors. This is to deduct the weight of moisture and refuse from the weight of coal as fired and the remainder is considered as combustible. However the refuse frequently contains a considerable amount of only partially burned fuel so that while the apparent weight of combustible is thus reduced a considerable proportion of the heat value of the actual fuel has passed into the boiler so that a misleading evaporative figure is thereby established. A further error is introduced if the refuse is not perfectly dry when weighed and this feature demands the closest attention on the part of the observer. These things are true with either, or any, type of boiler and sometimes lead to rather curious results. Thus ships WT1 and WT2 exhibit rather high refuse percentages and yet both are fitted with mechanical stokers. The other three ships are hand fired. WT1 with the highest refuse is using the same grade of coal (Pittsburgh mine run) as S1, S2 and WT3. WT2 is using a slack, evidently of low grade, as indicated by the b. t. u. value, nevertheless one is inclined to look for decided offsets through the use of stokers. Hence comes about the curious anomaly that the lower the combustible values the higher the efficiency when based on combustible, as any one with sufficient curiosity may demonstrate. It is not to be understood that this is confined to any type of boiler; among the reported trials of scotch boilers is an instance where the moisture is reported at 13.3 per cent (which is probably a fable) and ash at 16.1 per cent or a combustible value of 70.6 per cent. It would be interesting to examine 87 pounds of coal with 13 pounds of water added to it.

The dry coal efficiencies of WT1 and WT3 are missing because no b. t. u. values for the fuel are supplied. So far as Table I is concerned therefore the comparison resolves itself into lines 7 and 8. It is admitted to be a somewhat narrow base but lack of dependable data prevents its extension.

There is however a very broad field concerning which there is a considerable amount of information which is dependable in some respects but involves other factors besides boilers. Numbers of ships with both types of boilers have undergone trials where the only data of interest here lie in the indicated horsepower and the amount of fuel burned in terms of pounds per indicated horsepower. Metered water measurements are given in numbers of instances but are rejected for reasons already stated. Ash and moisture are given in many instances and may or not be reliable. On the whole it is believed that the results of their omission will average out. The indicated horsepower and the fuel weights may be accepted as fairly accurate and thus in a large group may be said to reflect the influence of the type of boiler on the ship's performance. The fuel per indicated horsepower is to be understood as for all purposes. To assist in making comparison the table is separated into two groups, classified under triple engines and quadruple engines. The data are condensed from trial reports derived from builders and owners and in some instances from trials conducted by outside observers of unquestionable competence. The author has excluded all data derived from trials in which he took any part or which were conducted under his direction. Some of the information is confidential and the identity of all vessels has been therefore withheld.

Table II Lbs. coal per I.H.P. per hr. all purposes.

	Triples			Quadruples			
	I.H.P.	Scotch	W.T.	I.H.P.	Scotch	W.T.	
1	1148	1.32		1574		1.58	A
2	815	1.43		1635		1.78	B
3	1890	1.79		1340		1.86	C
4	1270	1.40		1285		1.76	D
5	2066	1.71		1500		1.64	E
6	1983	1.44		1780		1.60	F
7	1780	1.58		1172		2.08	G
8	1644	1.80		1500		2.14	H
9	1728	1.68		2600		2.00	J
10	1820	1.65		1500		1.88	K
11	1834	1.54		1500		1.74	L
12	1066	1.58		1800		1.75	M
13	2400	1.59		1460		2.04	N
14	2500	1.79		1550		2.39	O
15	1600	1.49		1760		2.08	P
16	1410	1.47		1850		1.90	Q
17	1620	1.52		1925	1.62		R
18	1400	1.56		2070	1.65		S
19	2400	1.46		2100	1.68		T
20	1400	1.45		2125	1.75		U
21	1400	1.38		2200	1.66		V
22	1200	1.50					
23	1540		2.22				
24	2600		1.96				
25	1230		1.74				
Av.		1.54	1.97		1.67	1.89	

The table does not of course exhaust the list in any class nor even of ships from which figures more or less uncertain are available. Triple engines with water-tube boilers have been few in number and while quadruple engines with scotch boilers form a fairly large class reliable figures are scanty. All these ships are bulk cargo vessels and working under similar conditions as to fuel which, it should be kept clearly in mind, varies as to quality not only as between ports but also as between different fuelings in the same port.

The figures seem to speak for themselves. The quadruple engine contributes its share of responsibility but this point will be taken up later. Apparently the scotch boiler has the best of the argument by quite a wide margin. This may seem excessive but if we turn back to Table I for a moment we see that the difference there in evaporation from and at 212 degrees per pound of dry coal (line 8) averages nearly 23 per cent better than with the water-tube. It is true, as already said, that the examples in Table I constitute a very narrow base, but if we now look at Table II we see these same two ships reappear as 1 and 2 and we see that their fuel per indicated horsepower averages 1.38 and we see further that several ships in the same column are close up, two in fact better than S2. On the other hand the three water-tube ships of Table I are among the very highest as to fuel per indicated horsepower in Table II

To assist in visualizing the relative performances the figures from Table II are plotted in chart form in Fig. 1.

(*Continued on Page* 62)

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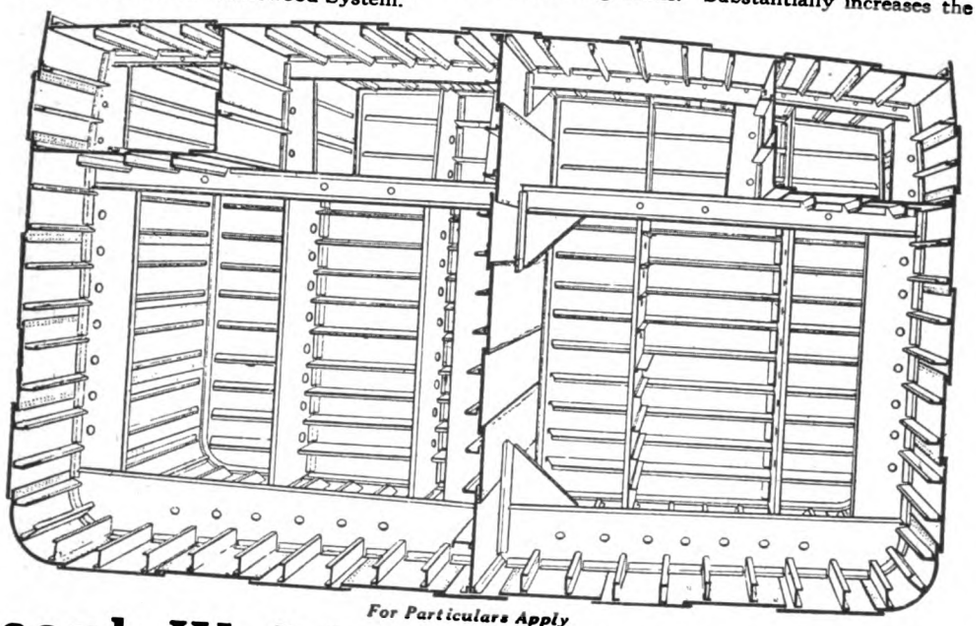

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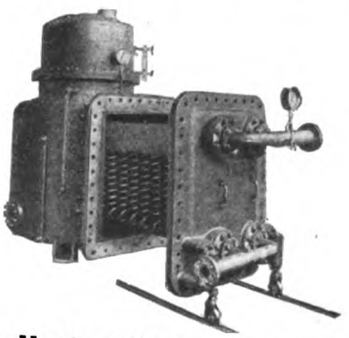

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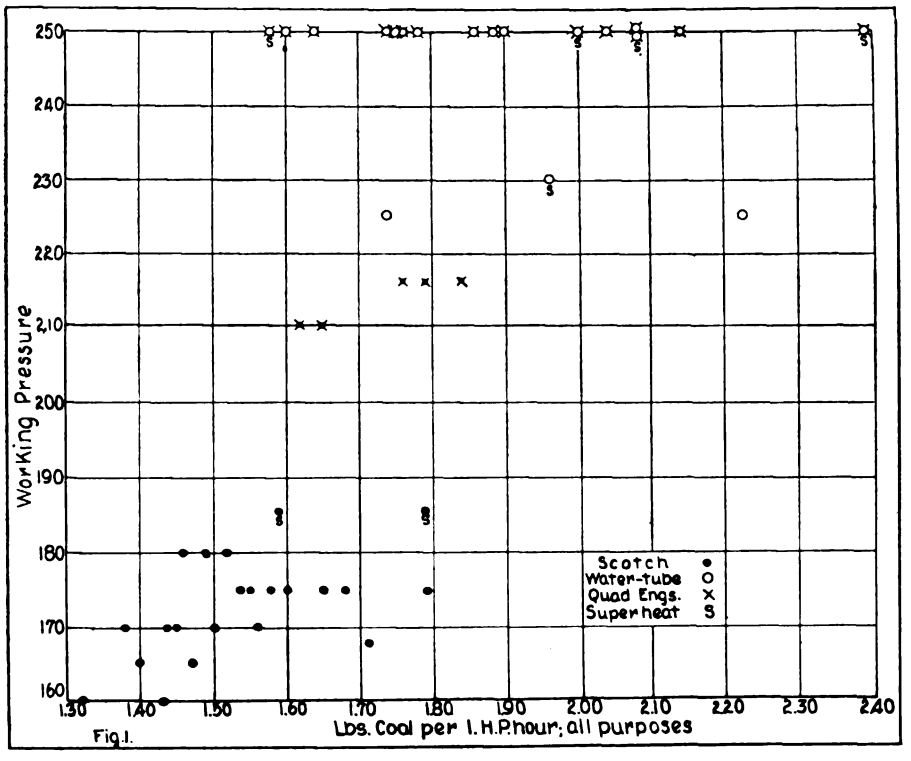

FIG. 1—RESULTS NOTED IN TABLE II PLOTTED TO SHOW GRAPHICALLY, PERFORMANCE OF LAKE VESSELS WITH VARIATIONS IN POWER PLANTS

(*Continued from Page* 58)

It will be observed from this time the contenders for the place of honor, the lower left-hand corner, are exclusively triple engines with scotch boilers and saturated steam. It may also be added that without exception they are equipped with jet condensers and attached auxiliaries. The closer the approach to the corner the lower both capital and operating costs become. If any lesson could be drawn from this it would seem to be that the most suitable working pressure for all-round purposes is about 170 pounds per square inch. This agrees entirely with the writer's own experience from which some interesting figures could be supplied but for the limitations already laid down, but it may at least be said that their effect would be to lower the average of column 3, Table II.

Cost Of Operation Is Affected

If we sit down with this information before us and attempt to estimate the economic features for a given ship of modern type of say 2200 indicated horsepower it works out something like this: using the indicated horsepower as a basis we can of course only consider the running time, or hours under way, and which for the average able ship in the average trade may be approximated at 150 hours per trip, but since a part of this time is at reduced power, suppose we say 140 hours at normal duty and 10 hours at about 1/3 power or 800 indicated horsepower, which gives a total of 316,000 horsepower hours. If the apparent difference in fuel efficiency actually existed the difference in fuel per trip in favor of scotch boilers would be about 57 tons (of 2000 pounds) or at average prices for the past season about $300 per trip, or, at 30 trips for the season, about $9000 for running time only. As with all calculations based on averages this figure is only approximate and may be in error for a specific case but the error may be in either direction. It may seem too high but it is equally possible that it is too low. Of course variables will occur as to hours under way, etc., but in general these do not affect the reasoning, they only affect the actual result.

On the other hand there is a claimed saving in weight. Reliable figures are fortunately at hand applicable exactly to the case. Three pair of ships with exactly similar hulls and engines are available for comparison and represent the latest additions to a fleet in which all belong. Column 1 gives figures for scotch boilers and 2 and 3 for water-tube boilers. It will be understood that each column applies to a pair although the figures are for one ship. Engines in all cases are of standard triple type. Mechanical heated draft is fitted in ship 1 and mechanical unheated in 2 and 3. (See Table III below).

It will be observed that considerable uncertainty apparently attended the installations in 2 and 3. Ship 2 shows for the same power nearly 16 per cent more heating surface and 44 per cent more grate surface than ship 1. For ship 3 the heating surface is again increased to 37 per cent over ship 1 and the grate surface is reduced so that it is 16 per cent above ship 1. The ratio of heating surface to grate area thus stands at, 42, 34 and 50 respectively. In other words the relative proportions as between 2 and 3 have apparently undergone an alteration of a per cent. Ship 1 is a type of which a number have been built without modification.

Difference In Weight

Presumably ship 3, which appears to represent latest practice, may be taken for the purpose of weight comparison with ship 1. It will be seen that the difference in boiler weights, including the water in the boilers, is about 60 tons, lying almost entirely in the water content and in the air heaters. These items are the most valuable things in the entire ship, the former constituting what Professor Rateau has so aptly described as "a steam flywheel" and

TABLE III

Comparative Weights and Costs of Scotch and Water Tube Boilers

		1 Scotch	2 Water-tube	3 Water-tube
1	Number of boilers	3	3	3
2	Total heating surface, square feet	5,814	6,695	7,965
3	Total grate area, square feet	137.5	197	159
4	Superheat	yes	yes	yes
5	Weight, boilers and superheaters, pounds	250,900	249,500	268,500
6	Weight, water in boilers, pounds	135,000	40,000	48,000
7	Weight, furnace fittings, pounds	30,800	13,400	13,400
8	Weight breechings and uptakes, pounds	14,300	18,700	20,000
9	Weight, fan and engine, pounds	6,500	7,500	7,500
10	Weight, boiler mountings, pounds	9,000	3,500	7,500
11	Weight, air heaters, pounds	40,500	none	none
12	Weight, stack, pounds	12,200	13,560	15,000
13	Weight, boiler covering, pounds	8,400	2,000	2,100
14	Weight, flue blowers, pounds	2,300	none	none
15	Weight, total pounds	509,900	348,160	378,000
16	Cost, approximate	$50,260	$60,830	$69,000

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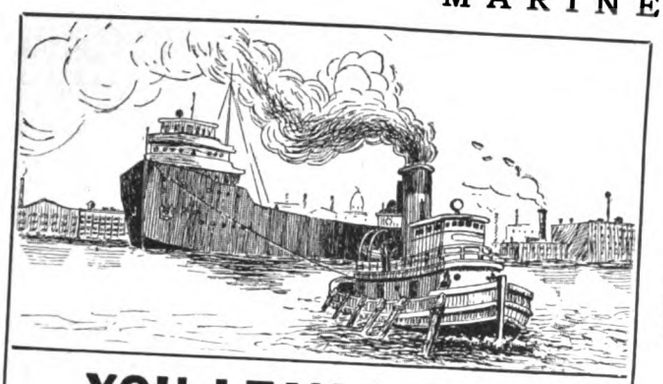

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the latter the most important improvement in boiler practice in 40 years. These factors will be referred to later and meantime to continue the economic comparison. The saving in weight should be reflected in increased cargo dead weight but if we have to put that saving back into the bunkers in the form of coal what has become of the saving in the boiler room? For this offset moreover it appears that we have to pay at the rate of around $9000 per year. There are also other charges as will appear from Table III. The installation in ship 3 represents in added first costs about 30 per cent more than in ship 1 and over $1000 per annum in interest charges. The foregoing is given for what it may be worth.

The next point mentioned by Dr. Sadler is that of higher pressures which we will pass for the moment since it will present itself later in connection with types of engines.

The next is superheat. There has been considerable noise made one way and another at different times with regard to various specifics in an engineering way but of the various kinds of noises none has been quite so persistent as the superheaters. If they only had their way one would have to wear asbestos clothing and smoked glasses around the ideal steam plant.

There are however some other things to be done aboard ship than to find out how much superheat can be packed into a pound of steam. The old advice to "first catch your hare" is very much to the point here. The first thing we have to do is to get our heat and every day necessity as well as common sense requires that we get it at the lowest cost possible. This, sooner or later, brings in the question of whether we shall sacrifice possibly 10 per cent in the cost of generating this heat in order to save 5 per cent in the using of it. Broadly stated that is the case in a few words. If the superheat can be obtained by utilizing otherwise waste heat well and good provided we really want it, but that condition does not exist in a well designed and operated installation where the temperature of the uptake is frequently below that of even saturated steam. That ends the argument before it begins in so far as waste heat is concerned. Then comes the question of how far it is profitable to go in the direction of taking some of this heat, which we have either been transferring to the water or using to promote and control combustion by heating the draft air, and apply it to superheating our steam. There are two answers; one leads to a point where it is difficult to decide whether the boiler or the superheater comes first, like the chicken and the egg, the other suggests examination and comparison of results. The foregoing is not to be understood as a denial of all advantage from superheating but only of the extent of the advantage claimed, keeping in mind working conditions as they exist with multi-cylinder reciprocating engines.

TABLE IV

Condensed Trial Report, Ships S1 and S2, Table I

1	Duration of trial, hours	12	12
2	Water to boilers per hour, pounds, all purposes	14,874	11,028
3	Coal per hour, pounds, all purposes	1,517	1,170
4	Ash, per cent	8.38	9.5
5	Moisture, per cent	4	5
6	Combustible, per cent	87.62	85.5
7	Dry coal per hour, pounds, all purposes	1,456	1,111
8	B.t.u.	14,200	14,000
9	Factor of evaporation	1.125	1.134
10	Water per pound dry coal, pounds	10.21	9.93
11	Water per pound dry coal, pounds from and at 212 degrees	11.48	11.26
12	Efficiency on dry coal	78.01	77.6
13	Indicated horsepower (I. H. P.)	1,148	815
14	Water per I. H. P. per hour, all purposes, pounds	12.95	13.52
15	Water per hour, auxiliaries, pounds	1,041	841
16	Water per I. H. P. per hour, engine only	12.05	12.38
17	Coal per I. H. P. per hour as fired, all purposes	1.32	1.43
18	Coal per I. H. P. per hour engine only	1.21	1.31
19	Auxiliaries, per cent of total	7.00	7.6
20	Fan, per cent of total	2.00	2.4
21	Steerer, per cent of total	5.00	5.2
22	Air pressure at fan, inches of water	1.00	1.25
23	Air pressure at ash pit, inches of water	0.375	0.40
24	Air temperature at fan, degrees Fahr.	88	90
25	Air temperature at ash pit, degrees Fahr.	298	308
26	Gas temperature at base of stack, degrees Fahr.	255	265

Where Superheat Is Effective

It may be admitted that in simple engines such as locomotives and most auxiliaries, a gain, so far as actual steam consumption is concerned, may be derived from moderate superheat. We are not operating locomotives however and the tail, representing the auxiliaries, has not quite begun to wag the dog. The turbine is absolutely dependent upon superheat; in fact it might almost be said without exaggreation that the answer to the question "why is a turbine" is "to provide use for superheaters." The reasons are simple and so well understood that it is not necessary to dwell upon them here. However because peppermint may be good for colic it does not follow that it is also good for chilblains. We are concerned with the matter of auxiliaries but superheat is not the answer as will appear in due time and with turbines we are hardly concerned at all.

Reliable reports of actual tests of multi-cylinder reciprocating engines with and without superheat and including the boiler efficiency are so rare as to be curious. Many reports are avaliable showing engine steam consumption with and without superheat and it may as well be said here that there are about as many on one side as the other, and among these are some which are so involved with the auxiliaries as to leave the answer in doubt. One report is found of such a test of a ship in the trade under consideration and showing an apparent economy of about 8½ per cent in favor of superheated steam, and the results are of interest. First, the superheat was obtained from absolutely waste heat, and the temperature of the stack even after passing the superheater was still greatly higher than it should be. Second, it is noted that the tests were not made under parallel conditions since in the superheat trials the ship was light and in the saturated trials she was loaded. Notwithstanding this, and everyone familiar with ships knows that there is a difference in revolutions between the two conditions, the main engines made higher revolutions and as much as 200 indicated horsepower more with saturated steam than with superheat at the same cut-offs and steam pressures. In order then to get the figures for comparable horsepower the cut-offs were shortened and the revolutions fell off and in consequence the speed of the ship was reduced 0.7 miles per hour. This reduction in speed is equivalent to about 5 hours for the loaded trip, or in other words if the engine powers had not been reduced the running time would be about 5 hours less and accepting the stated consumptions as accurate the difference would be about 17½ tons, or about $88.00, or about $17.50 per hour for a 10,000-ton ship. Probably no operator will feel any degree of enthusiasm over this showing even if

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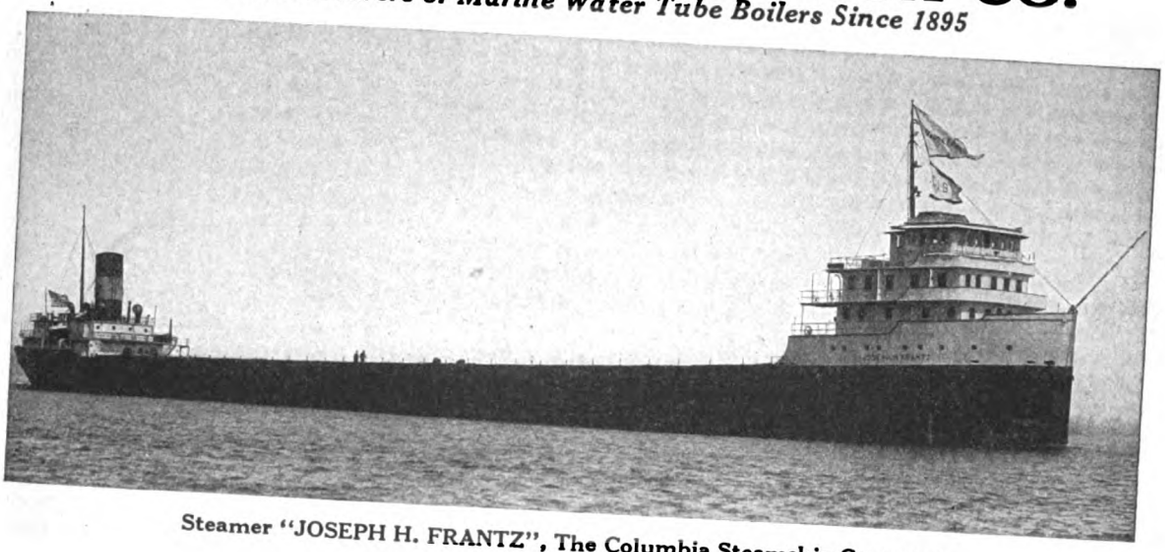

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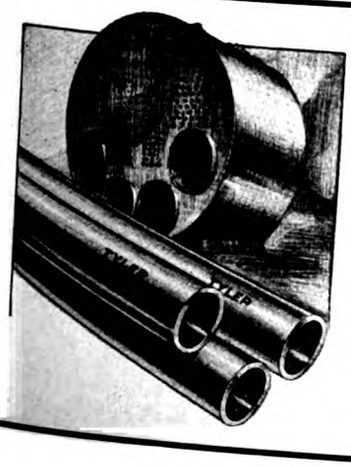

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it were not true that probably the greater part of the economy was due to the auxiliaries and only in part to the main engines. When it is further considered that a much greater economy could be attained by the use of a good heated draft system, in the light of the stack temperatures shown, and without sacrificing speed at all, that is to say with saturated steam, it hardly seems worth while to pursue the subject. However for once we may be allowed to go outside for an exactly confirmatory trial quoted in abstract from a German source.*

Trials With And Without Superheat

The experiments were made on a triple engine of which the cylinder dimensions in nearest American figures were 20 x 32 x 52 x 36 inches with two cylindrical boilers, 178 pounds working pressure. Three trials were made, with superheated, semi-superheated and saturated steam. As the degree of superheating is not stated we can only estimate these terms as meaning high or moderate superheat. As the superheaters contained nearly 28 per cent of the total heating surface and were of the fire-tube type the degree of superheat may fairly be assumed to be high. It will be observed that the boiler pressure and the cut-offs were maintained constant and the only variable is the steam temperature. To save space the results with semi-superheated steam are omitted as they fall between the other two.

In order to determine the difference in coal consumption for superheated and semi-superheated steam for the same speed the following results were obtained:

(a) With superheated steam, revolutions 75.2, coal consumption 14.852 tons per day.

(b) With superheated steam: In order to obtain the same revolutions the engine had to be linked out. Revolutions 74.6, coal consumption 16.412 tons per day. With superheated steam 1.56 tons more coal was required, or 10.5 per cent for approximately the same speed. Saturated steam would show a still greater saving according to my experiments.

The advantage of the superheated steam is to be its larger volume compared with saturated steam; the artificially raised temperature is also to retain the pressure of the steam longer during its passage through the engine, thus retarding condensation. If this is true why does the engine make less revolutions with superheated steam than with saturated steam?

Paragraph (1) shows that the high pressure cylinder produces 79 indicated horsepower more than the intermediate pressure. After the intermediate pressure cylinder had been linked in the high pressure cylinder still produced 65 indicated horsepower more than the intermediate pressure. Better results could not be obtained. The considerable drop in the initial pressures of the intermediate pressure and low pressure cylinders should also be noticed. It is evident that the lower initial pressures do not permit the intermediate and low pressure cylinders to produce powers equal to the high cylinder and this fact appears to be the reason for the lower revolutions.

Conditions shown in (2) are entirely different. The valve gears can easily be linked up to produce equal power in all cylinders.

As noted before superheat increases the volume of steam with the result that a smaller weight of steam enters the high pressure cylinder. Rapid condensation after leaving the high pressure cylinder does not leave a sufficient volume of steam for equal distribution of power in all cylinders."*

It will be observed also that the falling off in power figures in (1) occurs in spite of over 2 inches better vacuum, due apparently to about 13 degrees cooler circulating water. The difference in revolutions affected a reduction in speed of about half a knot, therefore tests were made to determine the difference in coal consumption at equal speeds. The figures indicate 10½ per cent higher consumption with superheated steam. The differences in initial and mean pressures indicate reduced cylinder condensation in the higher-pressure cylinder with superheated steam as is to be expected, but more rapid condensation in the receivers and in the intermediate and low-pressure cylinders, or to state it another way, apparent higher re-evaporation with saturated steam. Weismann adds "Considering the cost of the superheaters, the greater wear on the cylinder walls, piston rings and valves, the greater consumption of lubricating oil, more frequent cleaning of boilers, leakage of superheater tubes, etc., it is surprising that superheaters are still being installed. It must be mentioned that a superheater may be a gain in cases of one-cylinder engines getting their steam supply direct from the superheaters."

The foregoing tests may not be conclusive but are an offset to certain other reported tests which show only comparative water rates but ignore the cost of the superheating.

Experience so far indicates that the use of more than a very moderate degree of superheat is very largely experimental and hardly justifies any great degree of optimism as to results when weighed against a well designed and operated system in which otherwise waste heat is utilized in heating the draft air and so improving fuel economy. It not only makes for much better economy but puts the steam-making under absolute control regardless of weather conditions and very largely independent of grade of fuel. Further it converts the stokehold from an inferno to as comfortable a place as the engine room and very often more so. The use of heated draft is now so universal that not a carrier has been built without it for many years except in the few recent installations of water-tube boilers and it is to be borne in mind that it is in connection with this type of plant that superheating is most strongly urged.

Superheat Reduces Condensation

It is admitted that superheating is advantageous in reducing or avoiding the condensation in cylinders and pipe lines which is the great foe to economy, but it can not be had for nothing and the question is purely one of balancing costs and results. The costs consist of the diverted heat, the equipment itself and its maintenance and added risk, and the results lie in the hoped for improvement in economy.

Costs are definite, and in respect of equipment and maintenance are no small item, involving, with more than a very moderate degree of superheating, special designs and materials in many features. The results are very indefinite, although it is generally claimed that improvement in engine efficiency should follow. This should be reflected first in reduction in weight of steam for a given power and, if the added heat cost nothing, or was supplied by waste gases, would be further reflected in reduction of fuel. Furthermore the theoretical gain in engine efficiency is necessarily based upon constant power output and constant temperature of the superheated steam. In a marine engine the first condition obtains probably more nearly than in any other, but the latter is far from the case. Whether with the waste heat or radiant or fire tube type of superheater the temperature is constantly varying with the condition of the fires

* Weismann, Hamburger Technische Rundschau.

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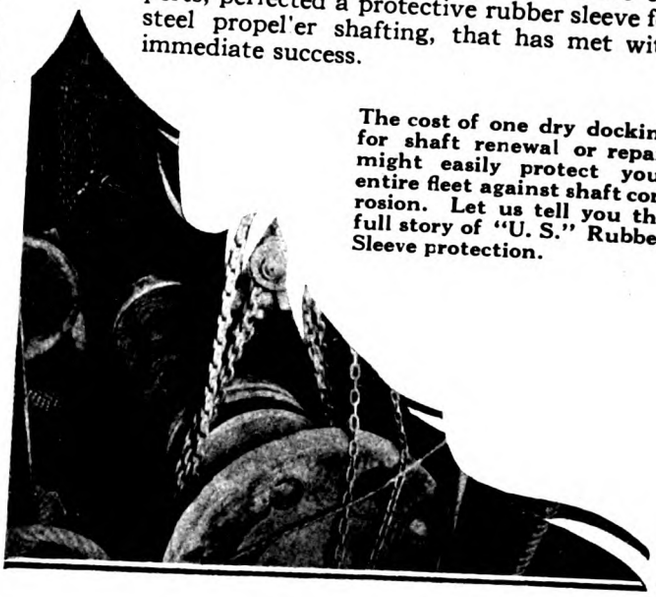

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and under hand-firing conditions as commonly existing these variations are very wide. It follows that the higher the designed or expected superheat the greater the influence of this variation.

In the light of such information as is available at this time there is little to indicate that such instalations as have been made have produced any improvement in fuel economy. On the contrary a reference to Table II will show that ships 14 and J and P are among the claimants for front rank in high fuel consumption and all are fitted with superheaters, while none of the best performers are so fitted. This may not be conclusive either, for reasons before stated, but must be accepted in the absence of evidence to the contrary, leaving the honors with heated draft and saturated steam. It might be added here that all of the scotch boiler ships, with one exception are fitted with heated draft, and that exception as might be expected is the highest in the list also with one exception and that is the ship already referred to as carrying superheaters.

Why Use a Surface Condenser

The surface condenser is next mentioned by Dr. Sadler as a feature of questionable value. For our purpose it may be grouped together and considered with the auxiliaries.

This form of condenser owes its recent introduction to lake practice to an effort to improve feed water conditions, desirable with all forms of boilers but imperative with water-tube, and also to obtain a better vacuum than with the jet condenser. We are not confronted here with the feed water conditions which make the surface condenser indispensable, as at sea, and the question therefore narrows down to one of comparative improvement and whether the improvement, if any, is worth the cost. The costs are definite and are made up of weight, first cost and maintenance, cost of circulating water and loss of heat at hot well. They also include the circulating pump which is an entirely additional auxiliary required only in connection with the surface condenser.

The weight cost amounts, including water, to around 15 tons, which is a reduction in deadweight to that extent. The difference in first cost is quite substantial and for the ship of today is around $7500 to $8000. Maintenance involves not only repairs, such as renewals of tubes and packings, but constant careful attention in guarding against air and water leakages. Working with fresh circulating water these leakages will not be so immediately apparent as at sea, but their development will proceed just the same and therefore all the more easily defeat the entire object of the installation so far as improvement of feed water is concerned. It is entirely probable that a little more experience with this type will abate any interest the engineers of lake ships may now feel. The overhauling of some thousands of tube ends and packings is not a job to arouse and hold enthusiasm if condensers are properly maintained. In seagoing ships where leakage makes itself apparent in short order the condenser is the principal battlefield and so serious is this question that in some instances duplicate condensers have been fitted and the practice is making headway. If owners and engineers imagine that the surface condenser holds its place at sea because anybody is fond of it they are badly mistaken; there is no one thing that would be jettisoned with heartier good will if water conditions were no worse than on the lakes, provided of course that turbines are not involved. Those who know it the best and have lived with it the longest hate it the most cordially and pray the most fervently for escape.

The circulating pump adds its quota to maintenance also. By cost of circulating water is meant the cost of the steam required to handle it and which is a variable depending upon temperature of water, vacuum desired, and the elevation, or difference between the draft of the ship and point of discharge, plus friction losses in condenser and piping. All these can be averaged however and the result will appear for the ship under consideration as of the order of 1200 pounds of steam per hour plus line loss. This will however be treated later with other auxiliaries.

The loss of heat at hot well with equal vacuum is safely 15 degrees and is more likely to be 20 degrees and is dependent directly upon the integrity of the condenser. Using the minimum figure however we find that the two items, circulating water and hot well loss, are costing us the equivalent of 160 pounds of fuel per hour or over 3½ per cent of the total actually used. There will be some salvage in the way of heat recovery from the exhaust steam but under no possible circumstances can the net loss fall below 2 per cent. So much for the costs, which, as indicated, can not all be exhibited in terms of money.

The benefits in this case lie entirely in anticipated improvement in feed water as compared with alternative systems ordinarily employed. Claims are made for collateral advantages such as established vacuum facilitating maneuvering. This however is merely a state of mind; in other words auto-hypnotism. Any engine with a good jet condenser and attached air-pump can be handled by anyone who understands his subject even superficially just as rapidly and effectively as with any other form of condensing apparatus whatsoever. To assert the contrary is merely to deny the plain facts and experience of the entire history of marine engineering and admit either lack of information or inability to assimilate it.

(*To be Continued*)

Shipbuilders Co-operate

(*Continued from Page* 56)

Johnson, president and general manager, Johnson Iron works; Paul F. Jahncke, vice president, Jahncke Dry Docks Inc; I. H. Aiken, president, and general manager, Aiken Tow Boat & Barge Co.; J. H. Langben, president, Galveston Dry Dock & Construction Co.; David R. Dunlap, president, Alabama Drydock & Shipbuilding Co.; John F. Prigge, vice president, Todd Shipbuilding & Drydock Co., and Thomas A. Johnson, president and general manager, Bruce Dry Dock Co.

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Late Flashes On Marine Disasters

Brief Summaries of Recent Maritime Casualties— A Record of Collisions, Wrecks, Fires and Losses

Name	Date	Nature	Place	Damage Resulting
Asiatic Prince	Dec. 14	Ashore	So. of Cebu	Floated—stem
Augusta G. Hilton	Dec. 24	Aground	White Head	Floated—leaking
A. Roger Hickey	Jan. 2	Struck ground	Wellfleet, Mass.	Not stated
Avocet	Dec. 1	Collision	Antwerp Roads	Starboard side
Ambleside	Dec. 6	Collision	Greenhithe	Plates; frames
Asuka Maru	Dec. 7	Stranded	Oshima Island	Not stated
Amy G. McKean	Dec. 9	Collision	Chatham	Damaged
Alvah H. Boushell	Jan. 1	Collision	Off Sewalls Point	Sank
Arracan	Dec. 14	Fire	Nr. Malta	No. 2 hold
Anaconda	Jan. 8	Collision	Nr. Maauslius	Damaged
Alfa	Dec. 30	Aground	Teignmouth Bar	Floated
Astoria	Dec. 29	Hvy. weather	Black Sea	Sank
Andreas	Dec. 31	Struck wreck	Antwerp	Aground
Bankdale	Dec. 14	Fire	Brooklyn	Considerable
Bidwell	Dec. 12	Aground	Newcastle	Floated
Breville	Dec. 13	Aground	Pointe May N.F.	Not stated
Bellepline	Dec. 14	Aground	Off Eagle Point	Floated
Balholm	Dec. 14	Not stated	Akrar, Faxe Bay	Total wreck
British Advocate	Dec. 3	Collision	Suez Roads	Damaged
Becka	Dec. 7	Fire	Malaga	Total loss
Boren	Jan. 4	Collision	San Pedro	Starboard side
Bereville	Dec. 13	Ashore	St. Johns	Not stated
Balholm	Dec. 13	Ashore	Akrar Faxe Bay	Totally wrecked
Bormida	Dec. 8	Struck quay	Catania	Bow
British Chancellor	Dec. 17	Collision	Suez Bay	Plates
Burnhaven	Dec. 16	Ashore	Loch Erisport	Total wreck
Brook	Dec. 21	Sank	River Elbe	
Barge No. 45	Jan. 11	Sank	Buzzards Bay	
Burpee L. Tucker	Jan. 12	Not stated	Seal Island	Total wreck
Charles A. Dean	Dec. 14	Ashore	Fryingpan Shoals	Abandoned
Concord	Dec. 14	Collision	Off Captains Isl.	Not stated
Conqueror	Dec. 25	Sank	Brooklyn	
City of Eureka	Dec. 20	Collision	Genoa	Damaged
City of Edinburgh	Dec. 29	Fire	Dan es Salaam	No. 2 hold
Clearton	Dec. 29	Disabled	E. of New York	Lost rudder
Camberway	Dec. 1	Collision	Lower Hope	Ashore—floated
Cap Padaran	Dec. 3	Collision	Suez Roads	Damaged
Candido	Jan. 5	Stranded	Savona	Not stated
C. H. Lawrence, Jr.	Jan. 5	Aground	Nr. Southport	Floated
Clara Mattheu	Not stated	Collision	At sea	Stem; bow
Chindwin	Dec. 22	Fire	Lisbon	Nos. 1 and 3 hold
Chika Maru	Dec. 22	Stranded	Wakamatsu	Floated
City of Eureka	Dec. 27	Collision	Genoa	Plates; propeller
Caboto	Dec. 29	Fire	Naples	Sank
Daniel Munro	Dec. 14	Collision	Off Captains Isl.	Not stated
Drafn	Dec. 31	Ashore	Above Wuhu	Not stated
Emperor of St. John	Dec. 8	Ashore	Lac Phees Beach	Rudder; propeller
Eugene Schneider	Dec. 00	Collision	Portland, Eng.	Sank
Ella	Dec. 7	Collision	Hamburg	Damaged
Erna	Dec. 7	Collision	Off Brunshausen	Sank
Essex Friar	Dec. 15	Aground	Sligo River	Floated
Eddie James	Dec. 16	Fire	Halifax	Totally destroyed
Enterpriser	Dec. 16	Collision	Blackwall	Starboard bow
Etna C	Jan. 6	Aground	South Channel	Floated
Emperor of Montreal	Jan. 8	Aground	St. Lawrence	Bottom—abandoned
Evelyn Manor	Dec. 28	Aground	River Tay	Floated
Franconia	Dec. 27	Aground	San Juan	Floated
Fenchurch	Dec. 30	Collision	Marseilles	Damaged
Fagervik	Dec. 9	Ashore	Nr. Blankenese	Floated
Fredville	Dec. 12	Stranded	Nash	Bottom
Freeman	Jan. 9	Fire	Long Island City	Not stated
Fritz Schoop	Dec. 28	Aground	Grimsby	Floated
Fenchurch	Dec. 30	Collision	Marseilles	Damaged
General Wood	Dec. 11	Sank	Saugus Harbor	Raised
Gaston	Dec. 27	Struck obj.	Rigers Island	Bow
Goliah	Dec. 17	Sank	Delaware	
George Allen	Dec. 00	Disabled	Not stated	Lost Prop.
Giralda	Dec. 9	Ashore	Zoutelande Bank	Floated
Guiding Star	Dec. 28	Not stated	London	Total wreck
Hibueras	Dec. 30	Ashore	South Pass	Floated
Hortensia	Dec. 7	Aground	Blyth	Not stated
Heathfield	Dec. 10	Collision	Gravesend	Port bow
Hans Maersk	Jan. 3	Collision	Off Pt. of Hook	Bow
Hudson	Dec. 10	Aground	Point Mandinga	Not stated
Honeysuckle	Dec. 16	Aground	Carlingnose	Not stated
Inverdon	Dec. 6	Stranded	Sandoe	Total wreck
Imerethie II	Dec. 2	Collision	So. of Tarifa	Damaged
Ibis	Dec. 11	Collision	Canada Dock	Sank
Island	Dec. 17	Stranded	Murman Coast	Sank
Ingomar	Dec. 28	Ashore	Malmo	Floated—leaking
J. Chester Wood	Dec. 20	Sprang leak	Nr. Surrey	Sank
Jessie Island No. 4	Dec. 30	Not stated	Pachena Point	Total wreck
Juan B	Dec. 30	Ran on rocks	Nr. Musel	Propeller
Karma	Dec. 26	Struck obs.	Pollock Rip Slue	Propeller
Karen	Dec. 8	Collision	Brunsbuttelkoog 84	Damaged
Kate Adams	Jan. 8	Fire	Memphis	Total loss
Kerry Head	Dec. 13	Struck quay wall	Limerick	Propeller
Kejserinde Dagmar	Dec. 22	Collided dock	Cardiff	Port side
Leader	Dec. 20	Disabled	S. E. Diamond Shoals	Lost rudder
Liberty Bell	Dec. 22	Struck quay	Marseilles	Plates
Loyola	Dec. 23	Ashore	Fortune N. F.	Floated
Lorenz L. M. Russ	Dec. 7	Collision	Hamburg	Damaged
Llanelly	Dec. 11	Stranded	River Usk	Floated
Lord Rhondda	Dec. 22	Fire	Dublin	No. 2 hold
Minnesotan	Dec. 24	Collision	Off San Pedro	Stem; plates
Moto	Dec. 5	Collision	Off Brunshausen	Not stated
Myrtle	Dec. 8	Collision	Cattewater	Hull
Meteor	Dec. 20	Collision	Andorf	Leaking
Mishima Maru	Jan. 10	Ashore	Yerimosaki	Not stated
Meta	Dec. 27	Aground	Kiel	Floated
M. L. 280	Dec. 27	Fire	Nr. Bass Rock	Sank
Muirton	Dec. 30	Collision	Marseilles	Not stated
Maple Hill	Dec. 29	Collision	Long Island Sound	Sank
Nordhval	Dec. 13	Aground	Yokohama	Not stated
Nettie C.	Dec. 14	Abandoned	So. of Cape Sable	Not stated
Neshaminy	Dec. 10	Sank	Kennebec River	
Norwalk	Dec. 17	Collision	East River	Bow
Nyoo	Dec. 28	Collision	San Francisco	Damaged
Newport	Dec. 29	Aground	St. Helens	Floated
Nardana	Dec. 2	Ashore	Long Reach	Floated
Noemi	Dec. 30	Aground	La Rochelle Canal	Floated
Niagara	Dec. 30	Disabled	Mid-Atlantic	Not stated
Oddesund	Dec. 8	Collision	Gravesend Reach	Stem; amidships
Phidias	Dec. 6	Collision	Greenhithe	Leaking
P. L. A. No. 24	Dec. 8	Collision	Gravesend Reach	Not stated
Pei Ming	Dec. 9	Collision	Tientsin	Badly
Prince Leo	Dec. 14	Collision	Blyth	Damaged
Pembroke Coast	Dec. 16	Aground	Teignmouth Bar	Floated
Philip Publicker	Jan. 10	Collision	Philadelphia	Not stated
Port Darwin	Dec. 28	Aground	River Elbe	Floated
Protos	Dec. 29	Hvy weather	Black Sea	Sank
Priscilla	Dec. 29	Fire	Skibbereen	To water line
Pomham	Jan. 11	Aground	Rose Island	Not stated
Rheinfels	Dec. 8	Aground	River Scheldt	Floated
Royal Scot	Dec. 10	Collision	Gravesend	Not stated
Roath	Dec. 10	Collision	Gravesend	Stern; starbrd. side
Robin Gray	Jan. 3	Aground	Kent Island	Floated
Ramapo	Jan. 4	Collision	San Pedro	Not stated
Rigalet	Dec. 11	Sank	Bordeaux	
Ribbledale	Dec. 28	Aground	Jersey	Bottom
Sagamore	Dec. 14	Collision	New York	Damaged
San Fraterno	Dec. 24	Collision	Off San Pedro	Extensively
Sept Freres	Dec. 8	Collision	Cattewater	Bowsprit
Suboatco	Jan. 3	Disabled	nw. Pt. Reyes	Not stated
Shreveport	Dec. 30	Aground	Lynchburg	Floated
Seneca	Jan. 6	Sank	Pier 39, Brooklyn	Raised
Swiks	Dec. 23	Stranded	No. of Cape Oland	Not stated
Smolensk	Dec. 27	Aground	Thames	Not stated
Sangstad	Dec. 29	Collision	New Orleans	Damaged
San Francisco Maru	Dec 29	Collision	Hamburg	Bow plates
Saint Joseph	Dec. 28	Aground	Isla Verde	Not stated
Tenas	Dec. 16	Disabled	Boston	Lost rudder
Talabot	Dec. 28	Collision	San Francisco	Damaged
Texas	Dec. 2	Collision	So. of Tarifa	Damaged
Tsuchi Maru	Dec. 9	Collision	Shimonoseki	Sank
Topdalsfiord	Jan. 3	Collision	Oslo	Holed
Trecarrell	Dec. 15	Struck quay wall	Roath Basin	Starboard bow
Thor	Dec. 22	Aground	River Ems	Starboard side
Thistletor	Jan. 6	Collision	Lynnhaven Roads	Plates
Taifun	Dec. 29	Ashore	Koehlbrand	Floated
Tosca	Dec. 30	Aground	Sandbanks	Not stated
Ushuaia	Dec. 16	Sank	Paysandu	Not stated
Unkai Maru No. 6	Dec. 22	Stranded	Wakamatsu	Floated
Ulanes	Dec. 29	Ashore	Haugshohne	Floated
Ville De Bassens	Dec. 9	Ashore	Dodding Head	Total loss
Velma M. Hamlin	Dec. 9	Collision	Chatham	Damaged
Valreale	Jan. 7	Aground	St. John	Floated—turbines
West Celina	Dec. 19	Fire	Nantucket Shoals	No. 2 hold
Walrus	Dec. 19	Sprang leak	Nr. Saybrook	Sank
Willets Point	Jan. 3	Collision	Off Point of Hook	Bow
Wesserling	Dec. 15	Ashore	Nr. Hillekroog	Floated—leaking
Woodarra	Dec. 17	Aground	Port Kembla	Not stated
Wheelsman	Dec. 18	Collision	East Waterloo Dock	Not stated
Woodville	Jan. 10	Ashore	Bermuda	Floated—leaking

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